Mining Journal

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Bawdwin Mines of the Burma Corporation

SYNOPSIS—In northern Burma, development work of the last few years has disclosed one of the world's great zinc-lead-silver deposits in the Bawdwin mines, long worked by the Chinese for silver. The modern exploitation of these deposits was undertaken in 1907 by Burma Mines, Ltd., which first began smelting the old slags for lead, and after many delays, undertook the active exploration of the sulphide orebodies. The development of these extraordinary orebodies and equipment of the property is now in the hands of a technical committee of the Burma Corporation, Ltd., which took over the property about a year ago.

THE STATION AT NAMTU ON THE BURMA MINES RY.

Namtu is 13 miles from the Bawdwin mines; the company's lead smelting plant, which was erected in Mandalay in 1907, has since been moved to Namtu

The accompanying engravings present some views of the Bawdwin mines in upper Burma at the time Burma Mines, Ltd., undertook the smelting of the old slag dumps left by the Chinese. Later the company began exploring the sulphide orebodies of these old mines. The development work of the last year or two has shown this property to contain one of the great zinc-lead-silver deposits of the world.

The exploitation and management of the Bawdwin mines was taken over in April, 1914, by the Burma Corporation, Ltd., and fortunately the development and equipment of this property are in the hands of a technical committee consisting of Dr. E. Heberlein, Theodore J. Hoover, A. F. Kuehn and R. Gilman Brown. Having the technical direction of the corporation in the hands of such a committee augurs well for the future of the enterprise. Some idea of the extraordinary metalliferous content of the ores, the width of the orebodies and the metallurgical problems involved may be obtained from the recent report of the corporation, from which most of the accompanying data were obtained. The stock-

holders are to be congratulated on the frank and full information given in the summary of the assay maps in the company's report.

Bawdwin mines are in Tawnpeng State, one of the Northern Shan States in upper Burma. The mines are connected with the Mandalay-Lashio branch of the Burma Rys. by a narrow-gage (2 ft.) line, 51 miles long, which meets the Burma Rys. at Manpwe, 544 miles from Rangoon.

Bawdwin Mines Antiguas

The Bawdwin mines were worked for many centuries by the Chinese for silver, possibly dating as far back as 2000 years ago. The present undertaking was started for the purpose of recovering the lead from old slag, estimated at 125,000 to 160,000 tons, left by the Chinese, and to prove and work the virgin ground below a vast open cut, locally called "the amphitheater." The smelting plant for the treatment of the slags, on account of flux supply, was originally erected at Mandalay, but in 1912 was transferred to Namtu on the company's own railroad, 38 miles from Manpwe and 13 miles below the mine.

The company's concession embraces an area of 2496 acres, beside various smelting and railway sites. The Sterne River in passing through the leases drops about 1000 ft. The average elevation of the mine area above sea level is 3200 ft. The ore channel is from 350 to 500 ft. wide, and has been definitely traced for a length of at least 8000 ft. The active work by ancients and by the present company has been concentrated on the northern 4000 ft., where the ore outcrops at the surface. The ore occurrence of present greatest interest is in nearly vertical shoots in feldspathic grit, locally classified as the Bawdwin series. The hanging wall in all cases, and the foot wall in some cases, is feldspathic grit, but the foot wall is generally rhyolite. The ore channel is capped by sedimentaries locally classified as the Banyan series, which dip at a flat angle to the south. The upper, or northern, 4000 ft. has been largely eroded. In this upper series, flat ore occurrences have been noted but from available data seem to be of minor importance.

The ancients devoted themselves largely to the exploitation of the high-grade silver-lead ore, while the work of the present company has been directed to the exploitation of the deposit as a whole. The principal orebody, the Chinaman, has been opened at the Chinaman tunnel level for a distance of 1300 ft. and an average width of 49 ft. The sulphide ore is of complex character and falls into four general classes, the predominating and most valuable metals being mentioned in the order of their importance: (1) Zinc-silver-lead ore; (2) lead-silver-zinc ore; (3) silver-lead-zinc ore; (4) copper-silver ore. The approximate assays of these four classes of ore are given in the accompanying table.

An Early View of Bawdwin, Showing Station, Offices, Ore Bins and Siding Shortly after the Modern Exploitation Was Begun

TYPE ASSAYS OF BAWDWIN ORES

Class of Ore	Silver, Oz.	Lead, %	Zinc, %	Copper, %
Zinc-silver-lead ore	24	26	30	..
Lead-silver-zinc ore	17	24	14	..
Silver-lead-zinc ore	40	30	26	..
Copper-silver ore	8	..	..	15

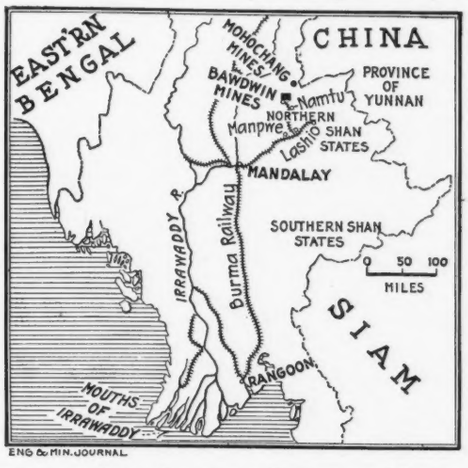
All major effort is today being devoted to the opening of the Chinaman orebody and the fulfillment of the program to extract and market 1000 tons of ore per day. Bawdwin is one of the few development operations that have not been stopped by the European war. This is partly due to the fact that this property is producing from

650 to 850 tons of lead per month, although only considered as yet in the development stage.

Development Work

The principal development at Bawdwin mines is through (1) the Chinaman tunnel, (2) internal shaft from the 171-ft. (Chinaman tunnel) level, (3) a 437-ft. vertical shaft, (4) the Tiger tunnel.

The Chinaman tunnel, the portal of which is 3650 ft. south and 100 ft. west of the vertical shaft, enters the ore channel at a point 1887 ft. south of the shaft and at a horizon about the same as the 171-ft. level of the shaft. For the present, it is the outlet for the 0, the 102-ft. and the 171-ft. levels in the Chinaman orebody, which is the principal development at the Bawdwin mine. The Chinaman orebody, as will be noted from the accompanying plan, contains a core of zinc-lead ore about 500 ft. long, with an average width of about 44 ft.; over the maximum width, 100 ft., the average assay was Ag 22.7 oz., Pb 25%,



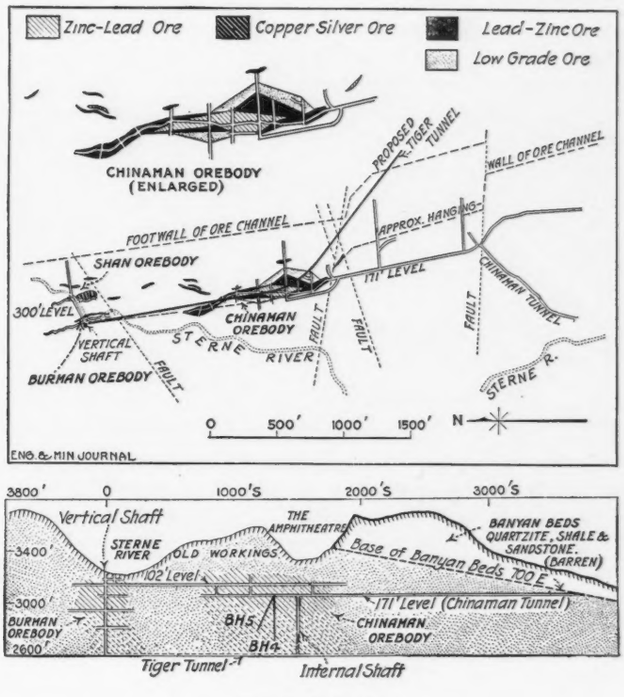
Sketch Map Showing Bawdwin Mines

Zn 29.8%. Lead-zinc ore envelops the zinc-lead core and extends over the whole length of the zinc-lead ore with various widths averaging about 29 ft.; over a width of 63 ft. it assayed Ag 23.3 oz., Pb 27.9%, Zn 16%. The two orebodies were 113 ft. at the point of maximum width; at this point the average assay for the total width was Ag 20.6 oz, Pb 25.6%, Zn 19.2%. Low-grade ore of possible value for concentration, but not at present considered in the ore reserve, partly envelops the other orebodies and runs from nothing up to 65 ft. in width; the latter width is at the point of maximum width for the other two orebodies and the average assay of the low-grade extension at this place was Ag 7.7 oz., Pb 8.7%, Zn 4.2 per cent.

From the 171-ft. (Chinaman tunnel) level, the internal shaft and bore hole No. 4 have encountered higher grade silver-lead-zinc ore than is today found in the upper workings of the Chinaman orebody, the presumption being that the high-grade silver ore in the upper part of the deposit was mined by the Chinese. The internal shaft was 168 ft. deep on Dec. 13; crosscuts driven at 67 and 124 ft. showed an average value over a width of 90 ft. of Ag 18.4 oz., Pb 21.3%, Zn 24%. Bore hole No. 4, between vertical depths of 136 to 254 ft., showed Ag 42 to 49 oz., Pb 32 to 39%, Zn 26 to 30 per cent.

Burman and Shan Lodes Narrower

The vertical shaft, from which the Burman and Shan lodes have been opened, is situated about 1400 ft. south of the north end of the Chinaman orebody and is now 437 ft. deep. Crosscuts driven at the 102-ft. and the 171-ft. levels intersected old workings, while the 300-ft. level and a crosscut at the 430-ft. level were driven in virgin ground. The Burman orebody on the 300-ft. level had an average width of 31 in. over a length of 190 ft., assaying Ag 37 oz., Pb 33%, Zn 16%, and a trace of copper. The Shan lode parallels the Burman lode about 150 ft. to the east; no attempt was made to cut the lode at the 171-ft. level, but at the 300-ft. level, chiefly south from the crosscut, a copper orebody was encountered, averaging about 15% Cu and 6 oz. Ag; on the 430-ft. level, the average value of the ore over a width of 23 ft. was Ag 21.7 oz., Pb. 24.4%, Zn 16.5%, Cu 2%. The pumps have been pulled in the vertical shaft and exploitation of



Bawdwin Beds
Feldspathic Grit, Ore Bearing
(Stippled Area)

Plan and Section through the Bawdwin Mines of the Burma Corporation

the Burman and Shan lodes discontinued, while the development on the larger Chinaman orebody is being pushed.

Tiger Tunnel 500 Ft. Below the Chinaman

The Tiger tunnel is being driven as a complete working entry to the mine. Its portal lies in the Sterne River valley at a convenient point of access to the Namtu smelting works. This adit will be 6000 ft. long, entering the ore channel a short distance south of the internal shaft. It will enter the workings about 500 ft. below the Chinaman tunnel and 660 ft. below the collar of the vertical shaft. The Tiger tunnel on Dec. 13, 1914, was in 673 ft., an average advance of about 85 ft. per month having been made by hand work; recently a power plant and rock drills were installed, and this speed should shortly be increased.

The technical committee of the corporation in November, 1914, estimated that on the 171-ft. level, an area of 63,500 sq.ft. had been opened on the orebody, equivalent to approximately 670,000 tons per 100 ft. of depth; and

on the 102-ft. level, an area of 43,000 sq.ft., equivalent to approximately 453,000 tons per 100 ft. of depth. The ore reserves are officially stated as: Proven ore, 440,000 tons, averaging Ag 16.3 oz., Pb 20.4% and Zn 20.5%; ore reasonably assured, 870,000 tons, averaging Ag 21.6 oz., Pb 24.6%, Zn 22.1%. The ore classed as "reasonably assured" is that in the wedge-shaped block connecting the extremities of the fully developed portion on the 171-ft. level with the developments of the internal shaft and diamond-drill hole No. 4, taking a vertical depth of 200 ft. below the 171-ft. level. Commenting upon the ore reserve, the technical committee states that the bottom of the mine is in the highest grade ore and the greatest widths yet encountered.

The present equipment at the property consists of a lead-smelting plant, a lead refinery, an experimental mill, various mining equipment and 51 miles of railway of 2-ft. gage. The company's smelting works comprise three blast furnaces, two roasting furnaces, and H-H sintering pots having a capacity of 3000 tons per month. The output of the smelting plant is about 750 tons of lead bullion per month. The company sells soft, refined lead and also silver-lead bullion. At the beginning of the European war, the company was selling at a profit to Continental smelters about 2000 tons of zinc-lead ore per month, derived partly from development. The company is now stockpiling from 1500 to 2500 tons of this ore monthly, but has found a market in the East for much of its lead, owing to other supplies having been cut off.

Annual Production of 300,000 Tons

It is proposed to place the Bawdwin mines in a position to produce 300,000 tons of average ore annually, and in order to get on this basis the technical committee reported in April that it was necessary: (1) To complete the Tiger tunnel, carrying on internal development concurrently; (2) to widen and realign the route of the railway; (3) to install a hydro-electric power plant; (4) to erect a concentration mill. The capital outlay involved in this program is roughly estimated at £250,000, not including the cost of reconstructing the railway. It was estimated that about two years would be required for the consummation of these improvements and during this period the production at the mines would not only cover administration expenses, but contribute materially to the capital outlay. Some of the improvements have already been made and others started. Surveys have been completed for the hydro-electric-power development at Mansam Falls and the plant will be ordered in the near future.

The high metal content of the Bawdwin ores is partially offset by their complexity, and the profit value does not follow from the gross value, but rather from metallurgical considerations. The working costs under the new program were estimated by the technical committee, in April, 1914, as follows: Development, mining and hand-picking, 12s.; transport to Europe, 41s. 6d., or a total of 53s. 6d. In case of concentrating the ores, there would be an increased cost due to this operation but a decreased cost for transport charges, and the costs in this case are estimated to be under 40s. per ton. In view of the extraordinary gross value of the ores, there is a great opportunity for the expansion of profits by the development of metallurgical methods for the recovery of the various metals; but it is too early to make any definite statement as to what can ultimately be done in this direction. Shipments of average grade zinc-lead ore, without any attempt at hand-picking, namely, of a grade of 30% Zn, 26% Pb and 23 oz. Ag, showed a profit of from £2 to £2·10s. per ton of ore, when the combined metals had a value of £39, the average prices of the preceding four years.

The lead-zinc ore will require concentration prior to shipment. This ore is of higher average grade than that of Broken Hill, and of much the same general metallurgical character. Considering that the working conditions will be more economical than at Broken Hill, the technical committee estimates that the profit per ton on the lead-zinc ore should be about £2 per ton. The copper-silver ores can be smelted locally, at a profit of approximately £3 per ton under average copper markets, but as yet no consideration has been given to the question of equipment, etc., on account of other development connected with the larger zinc-lead and lead-zinc orebodies. The above were pre-war estimates, but Chairman H. C. Hoover at a recent meeting stated that the cost of placing either crude ore or concentrates into metallurgical establishments in Europe would not exceed £3, whereas the value of the ore was from £11 to £18, thus leaving a comfortable margin.

Boulders of Slag in Old Dumps at Bawdwin

A great diversity of labor is employed at the Bawdwin mines; Chinese are used principally as miners, Hindoo coolies for ordinary surface work, the Shans and Kachins for jungle and timber cutting, transporting, etc. Chinese are also chiefly employed at the smelting plant. The Bawdwin operations are in the local charge of C. H. Macnutt, general manager, and Thomas Mitchell, formerly of Butte, is assistant manager.

Mohochang Mines and Other Prospects

Besides the Bawdwin mines, the Burma Corporation has acquired a 90% interest in the Mohochang mines, situated about 20 miles north of the Bawdwin mines. There are also extensive ancient workings in this property, and a considerable amount of slags from ancient smelting operations. The ore seen on old dumps is similar to the Bawdwin. A small furnace has been erected and produced lead from the slags; smelting has been stopped, but exploration work is in progress. The company has also acquired a large interest in a promising copper prospect. The work on the prospects in the immediate future will probably be purely exploratory and not of magnitude until general conditions are more favorable.

Rectangular Mechanical Furnaces

By Godfrey Vivian*

SYNOPSIS—Some of the salient characteristics of the Edwards and Merton types of rectangular, mechanically rabbled furnaces.

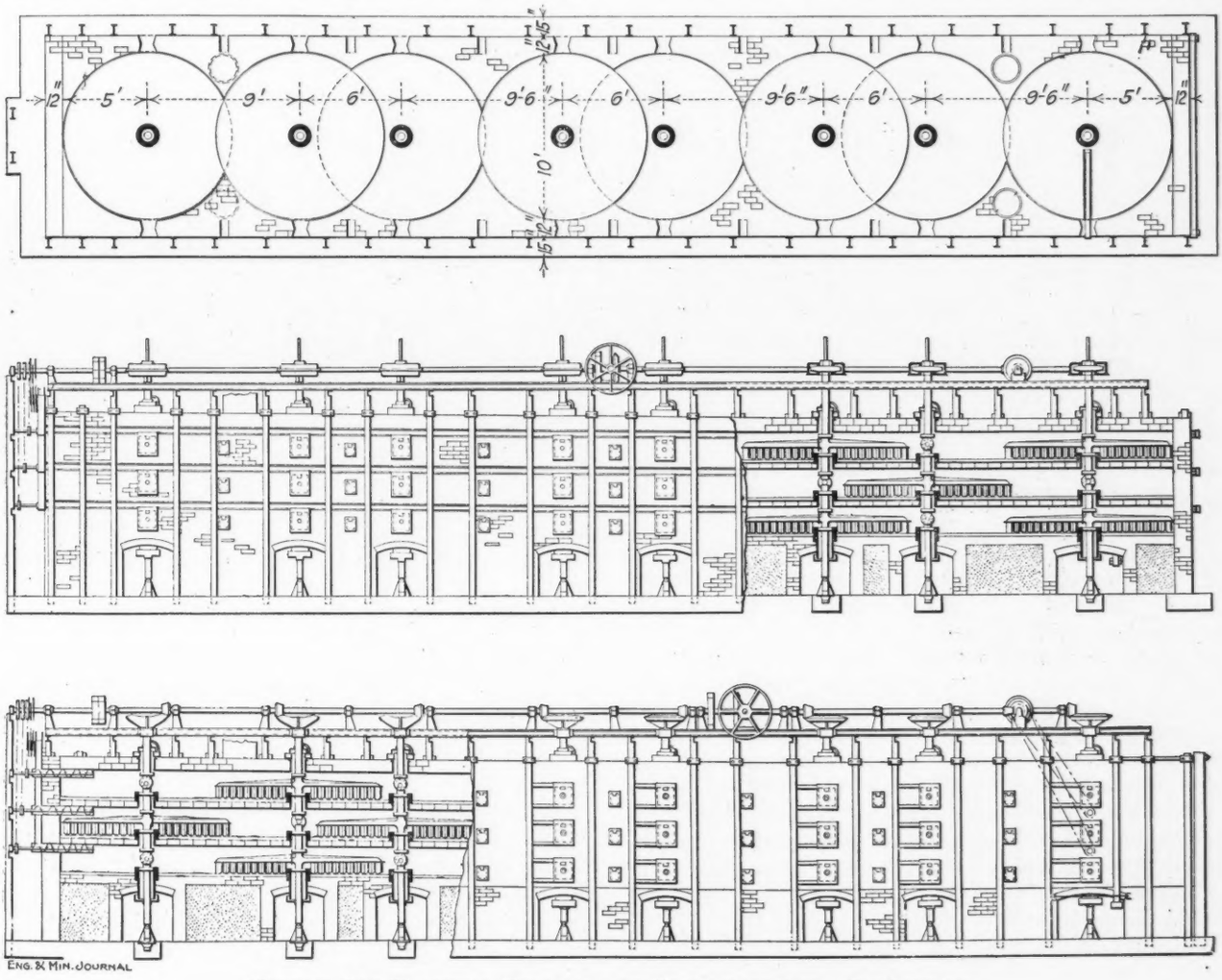
The development of mechanical furnaces has advanced considerably more in Europe than in either America or Australia, the cause being that more complex ores are worked and that a mechanical furnace capable of producing sulphuric acid from complicated blende ores and at the same time leaving the blende with very low sulphur, calls for a calciner designed on very scientific lines.

It is at once apparent to the metallurgist that the multiple hearth, with its capacity for passing the heat through the brickwork to the bottom of the charge above, must be productive of a saving in coal over the long straight hearth; but the difficulty to be overcome of keeping up the hearths from falling in has led to a fact being discovered in practice that to have a safe arch the rise should never be under ½ in. to the foot.

Here again in Europe this has led to the duplex furnaces being designed in two separate units with a division wall, as against the duplex with no division wall and intersecting rabbles as in the Edwards of Australian gold-telluride roasting practice. On the question of capacity, this led Edwards to adopt his variably inclined hearth, but in Europe the means of augmenting the speed of ore fed through the furnaces has proceeded on other lines.

Means of Accelerating Speed of Ore through Furnace

It is perfectly evident that where a hearth has an inclination and all the rabbles intersect at about their middle path, the progress of the ore through the furnace is in no way dependent on the length of the furnace, progression being produced by the talus or heap at the end of the rabble being less when the rabble is at its highest point from the level than when it is at its lowest; that is, there is more ore falling away from the rabble when it is near the fire end than when at the feed end of the furnace.

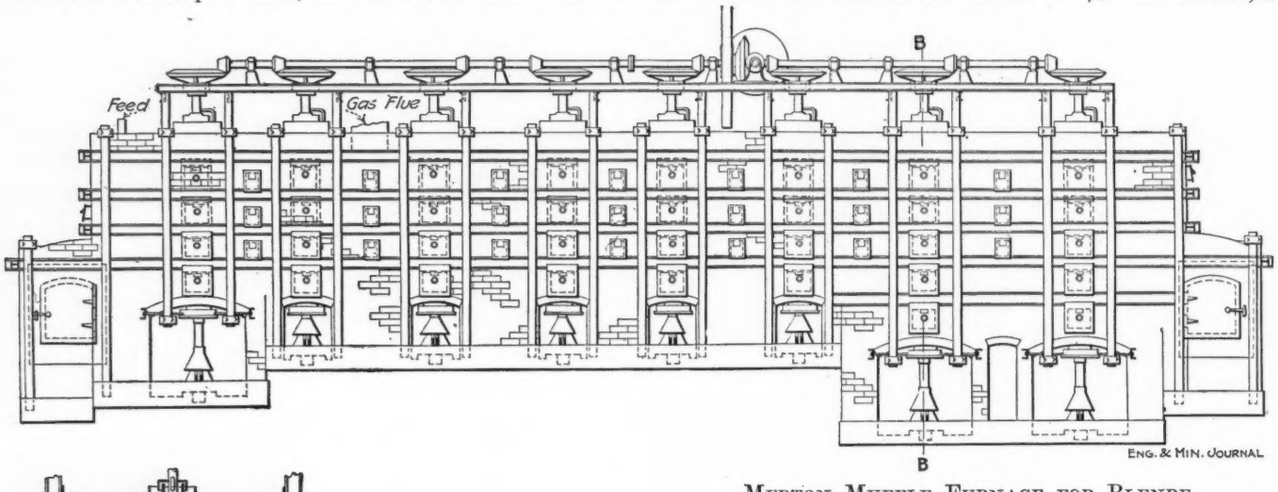


Merton Ore-Roasting Furnace for Sulphuric-Acid Production

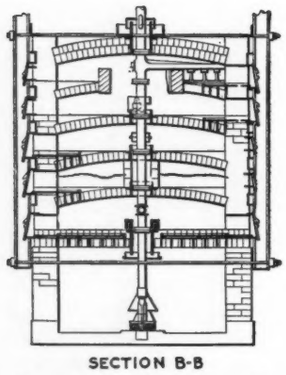
*Mining and metallurgical engineer, Camborne, Cornwall, Eng.

In an Edwards duplex furnace the backwardation[1] is tremendous. In an ore that has to stay in the furnace a very long time, this type of furnace is advantageous, but supposing that capacity is necessary, then we have to resort to other means of preventing backwardation. In the Edwards duplex, the rabbles do not intersect each other even approximately to the middle of their paths in certain blocks. These particular rabble-arms, where the paths of the rabbles only slightly intersect, are fitted with an involuting rabble, so that backwardation is impossible beyond the obviously designed or intended limit.

Backwardation may also be prevented by stepping the hearth, and setting the lower rabble to cut under the other, or it may be obtained in the Edwards duplex furnace by setting the rabble-arms perpendicular instead of inclined, which really amounts to the same thing as stepping. If further backwardation in the Edwards duplex furnace has to be prevented, all the rabbles on one side of the furnace must revolve the same way, in such a manner that when the rabble goes up the incline, it shall do so by going up against the wall of the furnace and down in the middle, since no talus can form against the wall but can in the middle of the calciner.



MERTON MUFFLE FURNACE FOR BLENDE AND COPPER MATTE


SECTION B-B

The advantages of putting all involuting rabbles on one set of arms and devoluting rabbles in the following set can also be seen from a consideration of the Edwards furnace. The speed of rabble arms may be from 1½ up to 8 r.p.m. Where dusting is at all pronounced, the long multiple hearth stirs up obviously less than does the circular calciner.

CHARACTERISTICS OF GOOD CALCINER BRICK

The whole question of bricks in a calciner is one of degree of heat, but the expansion or contracting under heat must also be tried practically, before the bricks are put into a furnace. Care should always be taken to have a chemical analysis made of the bricks as high lime and heat are incompatible, because the bricks disintegrate. The effects of sulphur on the brick should also be tried and in no case should old bricks be used, because if any compounds of alumina and sulphur are formed in the brick, these in the presence of water will so swell that the bricks will not only disintegrate, but heave all the brickwork and arches out of level. Firebricks should never be too siliceous or contain too much alumina, as too much silica swells, and so causes the arches to rise to an extent that may interfere with the rabbles, while too much alumina will drop the arches so that often bricks will drop out and cause breakage in the calciner.

A good brick should have the alumina and silica balanced with the lime somewhere about 3%. In texture, a fine brick should of preference have the silica in small angular 2- or 3-mm. grains as quartz; this keeps the brick from splitting under heat, which is most important.

Most European multiple-hearth calciners have a jack at the bottom of the shaft, so that the rabbles may be lifted or lowered as the furnace changes in temperature.

Rabbling a furnace in an excess of hot air, in a muffle, is peculiar to the Merton calciner, and is particularly advantageous in blende ores that contain lime, magnesia, baryta, etc.

FIREBOX CONSTRUCTION

In regard to firebox construction, the semiproducer type seems to be replacing all other forms. Whether hollow firebars are used for the production of hot air for calcination or combustion purposes depends entirely on the coal and the labor. When the Welsh firebox is used with clinker-grate, the air is best taken from below the firebars. All iron work used in the furnace has resolved itself into cast iron for shafts and rabbles. All shafts are being made hollow with either an internal tube for water circulation or with a division, but the internal water tube easily takes first place when there is much heat required. Where the furnace is water cooled, there are a number of heat units lost in the process, so that practically wherever water or air is used for cooling process it becomes more economical to cover the rabbles and shaft, more particularly those in front of the fireplaces,

[1]Backwardation is the term applied by the author to the tendency of ore in the mechanically rabbled furnaces to go round in a circle with the rabble, instead of proceeding through the furnace.—EDITOR.

with clay, so that the coal may be saved. A simple calculation on any water-cooled furnace as to the amount of heat lost in heating the water for the rabbles will make this point assume its proper proportions. These coverings may be made either in tile or a mixture of fireclay and long-fiber asbestos mixed into a clay with silicate of soda solution (12½%). All bricks in the arches should be dipped in a mud of fireclay mixed with silicate of soda (12½ to 15%) solution. The proper proportion is found by making the mud and trying it on the bricks to be used in the firebox of any working furnace.

Feed is a most important point in mechanical-furnace construction. Usually a calciner fed from the side to the top rabble, and the flues taken off between the first two shafts, will give good results. Sticky or wet ores are best fed by means of a worm such as is used on a pugmill and the amount of ore regulated by a measurer with pockets. The speed of the measurer is regulated by a ratchet wheel placed on the outside, with the rachet on a variable arm worked by an eccentric from the main shaft of the calciner, which by varying on a slide will move the measuring wheel either one or two teeth.

Another good feeder is a hopper made so that it can be lowered onto a revolving plate placed in the center of the hopper. The method of forming muffles so that the gases may be taken off resolves itself into building three small walls along the back of the arches and covering them with large firebrick tiles that dovetail the one into the other. The passing of the ore from one hearth to the other is done by cast-iron or fireclay pipes.

As to gearing, all tendencies seem to be toward the worm gear in oil. Mechanically, the worm may be inefficient, but it is dust-proof, and its great advantage is that the internal tube for water circulation (for flushing out the rabble arms) may be placed at any height and the gear got near to the furnace.

The Merton calciners are in use both in Great Britain and on the Continent. The calciner for roasting tin concentrates containing carbonate of iron, arsenic, sulphides, etc., dries the concentrates on the top of the furnace, which does away with the expense connected with drying concentrates and the labor connected with it. The main arch is constructed of solid interlocking firebricks so that it is never possible for the arch to collapse or for firebricks to drop out into the calciner, thus causing serious breakages.

Kerr Lake

The report of the Kerr Lake Mining Co., Cobalt, Ont., for year ended Aug. 31, 1914, states that 1,828,424 oz. of silver were produced on which a profit of $620,785 was made; $614,000 of this was paid in dividends. Total dividends to date amount to $5,220,000. The cost of production is given as follows: Mining and development, 12.49c. per oz. of silver; shipment and treatment charges, 11.61c.; administration and general, 0.76c.; total, 24.86c. per oz. of silver. The smelters' settlements show a production of 1,670,933 oz., indicating a deduction of 174,122 oz. of silver in the way of treatment charges and losses. Ore reserves were estimated to contain 5,698,700 oz. of silver. Development work for the year amounted to 5399 ft.; stoping, 37,100 sq.ft.; and trenching, 2513 ft. Development work to date amounts to 40,062 ft. Altogether, there were 44,794 tons of rock hoisted; of this, 33,955 tons were ore and 10,839 tons waste. Of the ore, 321 tons were sacked, 16,130 tons milled and 17,504 tons discarded as waste from the bumping tables. The mining cost was $5.09 per ton of rock hoisted.

Mining Prospectuses

By T. M. C.

Many a peevish wail has been blatted forth from between the gnashing teeth of unphilosophical losers in the mining game; and a very common grievance is that the prospectus of the mining company was deceptive. Such, unfortunately, is often the case. But perhaps the average mining prospectus would assay fairly high in frank honesty as compared with some of the "documentos ineditos" of the ordinary business world. Consider, for instance, that fruit vulgarly known as the "cackle berry." Down in Mexico, when Juan brought in a basket of eggs from the ranch, he would offer them "as is" at a flat rate of 3 centavos each. But if we insisted upon putting them through the inquisition "trial by water," the innocent eggs which sank commanded a rate of 4c. each, or "tres reales y media la docena si toma Ud. todo." But in New York City you may be offered eggs which are neatly labeled with a rubber stamp; in some cases even dated. The shell of such an egg is literature. It is a mining prospectus. If we see a duck egg labeled "Fancy White Leghorn" we are shy of investing. The egg may be perfectly fresh and wholesome, but we instinctively know that there is something wrong, although the primary or the ultimate vendor may be entirely innocent. Some benevolent duck with perverted maternal instincts may have "put one over" on a perfectly respectable hen. A zealous employee of the vendor, working overtime, stamps the egg with the official label. A slave to routine, he dares not intrude his personal convictions, lest he be haughtily reminded that his task is simply to label each egg to correspond with the hen in whose nest the egg is found.

Mining engineers are frequently employed by individuals and companies interested in the preparation of mining prospectuses and reports which are simply revised editions of prospectuses. And in rare cases a genuine engineer is permitted to arrange the final proof sheets of such publications. It is customary for the employer to outline the class of report desired; and an engineer may be asked to report upon certain definite features of a mining property or proposed undertaking, being requested to pay no attention to other features, the consideration of which might involve the unnecessary expenditure of time or money or both. And there have been cases where there existed other motives for restricting the activities of the engineer. In the preparation of a prospectus the name of the engineer is often omitted, especially in the cases where much of the subject matter of his report has been eliminated. Such action on the part of prospectus editors does not necessarily imply dishonesty. Those who publish mining prospectuses have something to sell, as a rule.

It is natural that they should desire to present their proposition in the most favorable light. The reader is privileged to investigate all statements before purchasing stock. If he buys, he can have no just grievance on the ground that the literature was deceptive, unless he can prove that the prospectus contained false or deliberately

misleading statements concerning supposed facts. For example, let us imagine that you have organized the "Peg Leg Imperial Gold Mining Co.," incorporated under the laws of the state of Arizona, with a capitalization of 1,000,000 shares at a nominal par value of $1 each. Then suppose you issue a prospectus, offering 250,000 shares of treasury stock at 10c. per share. An invitation to get rich could be concocted by first quoting verbatim one or two newspaper accounts of the marvelous gold discovery said to have been made by "Peg Leg Smith" in the early part of the past century. Then note that when Melchior Diaz reached the Colorado River it was called the Tizon. Casually remark upon the resemblance of this name to the Pison, listed in the opening chapters of the book of Genesis as a river abounding with gold. It is unnecessary to state that historians say Diaz named the river "Tizon" because of the habit the Indians of that region had of carrying firebrands to keep warm. Some historians are malicious or idiotic liars; and anyhow, too much of the wrong brand of history will interfere with your business. Repeat a little of what aids your purpose, and let the other fellow have plenty of bucking space for the hobby of his imagination. All you have to do is cinch the saddle tight.

Briefly outline the purpose of Coronado's expedition and show what quitters they were to give a black eye to regions which now abound with prosperous mining camps. Mention that Cardenas (sent by Don Pedro del Tovar to investigate the lake on whose shores much gold was said to be found) was headed straight for the Peg Leg zone in the Salton Basin near the lower Tizon (Pison?), and would no doubt have reached that section if he had continued on the schedule as planned by the Moquis of Tusayan. Casually note that the Spaniards were looking for seven cities as per the original dream of their pre-Columbian ancestors, and that the Indians of the Southwest almost without exception had met the overtures of Alvar Nuñez Cabeza de la Vaca with the mystic word of "Cibola," following this up with the cheerful pastime of killing until but few remained alive to reach the viceroy with the tales which inspired the expeditions of Fray Marcos de Niza and Coronado.

Then note the resemblance of "Cibola" (pronounced by some Spaniards as "Sibola" and by others as "Thibola") to the mysterious test-word "Shibboleth—Sibboleth," which the Bible mentions as being propounded by the guardians of a river to determine the credentials of those who desired to pass. If you can work it in tactfully, render the name of the city Tusayan as "Tuz-Ayan," and fake up some clever English equivalents for the words "Tuz" and "Ayan," which seem to be favorite geographical appellations for that portion of Turkey where some theologians have assigned the river Pison. To clinch the error of such location, show that the source of the river which waters Ethiopia is quite remote from that of the Euphrates, thus exploding the theory that the four rivers which sprang from the Garden of Eden had any connection with the vicinity of Mount Ararat. Scrupulously avoid quoting Mr. Dominian ("Trans. A. I. M. E." XLII, p. 586), lest you damage your case.

Continue reference to the Bible by quoting the text about King Hiram and the ships of Tarshish bringing gold to King Solomon, and show by a calculation from data in I Kings, x, 14, that some $20,000,000 in gold was conveyed in one year; and show by verse 22 that the ships returned every three years. Call attention to the fact that the original Mr. Tarshish was a grandson of Japheth, first mate of the ark. Also note J. P. Jehosophat's experience in attempting to reorganize the Tarshish Navigation Co. and the location of his shipyard. Mention the date palms found in the Salton Basin, touching upon the mystery of their origin. As the author George Wharton James expresses it, "Whence came these date palms?" They yield a very inferior fruit, but dates. Trees propagated from date seeds also yield inferior fruit. Now call attention to the fact that the principal date region in the world is that from whence sailed the mysterious ships of Tarshish.

Quote an article published in the National Geographic Magazine, about five years ago, which speaks of the reported finding of an ancient sailing vessel imbedded in the shifting sands near the Imperial Valley; showing how it was surmised to have been Spanish, but that no precise investigation was ever made. Here again it is quite unnecessary to state that of a fleet of four vessels which followed up Alarcon's explorations of 1540, three disappeared and were never heard of again. In a mining prospectus you must not tell too much.

Give a moderate dose of figures and calculations based upon the writings of Major Powell and others, showing the approximate tonnage of rock which was yielded by the immense watershed of the Colorado or Tizon (don't forget to put in "Pison?" once in a while) River. Enumerate several of the rich gold mines now operating within that territory, milling the residual roots of veins long since eroded. Give an approximate total of production of all gold mines within the limits as aforesaid. Show the grinding power of the rocks in the cañon rapids, beside which the puny efforts of a man-made pebble-mill slimer shrink to insignificance. Estimate an infinitesimal value per ton of rock, and then cast up the figures showing what must have been the value of all the gold in the millions upon millions of tons of rock which crumbled and passed beneath the waters. Call attention to the golden sands on the beach at Nome and other points, and then blandly ask where is the gold of the Tizon. Where?

Then summarize your random quotations and weave a plausible theory in the hypnotic form of making the reader believe that it is his own clear, logical mind which has deduced the inevitable conclusion—namely, that the gold is where it is. Practically, it is where you find it, and in several other places. Be careful not to jolt the mental processes. A few adroit questions will start a train of thought in the reader's mind, and you have him going till the whistle blows. That is, a certain class of investor. Cap the climax with the description of a plausible scheme of operation and a list of good, honest directors and perhaps (mind you, we say *perhaps*) we might take a few white chips ourselves, just for the fun of the thing. You see, the drills might show no appreciable values in gold; but if water in sufficient quantity for irrigation is found, the result would be of everlasting benefit to humanity. However damfoolic such a mining prospectus might appear to a mining engineer, it would be hardly less rational and logical than some real ones we have read. And they got the money. If you do not believe that even the wisest of bankers relish a bit of nonsensical finance now and then, just glance over the unexpurgated lists of the appraisals of their estates.

The Opportunity in Placer Mining

By Carney Hartley*

SYNOPSIS—Placer mining outside of dredging little developed. Expert handling neglected. Opportunity exists in semiarid regions. Failures largely attributable to lack of mechanical-engineering experience. Ore-concentrating methods available in general way. Round sum must be spent for plant just as in case of dredge. Full-circle-swing steam shovel offers attractive possibilities. Treatment involves roughing process and final concentration. Typical plant shows characteristic failures but offers suggestions. Little skilled labor needed.

In a letter recently received from the editor of one of the American mining journals, placer mining is referred to as being largely a prehistoric art. In the minds of a great many people, it has unquestionably about this position, and when we consider what has been done for it, we should almost feel justified in going back to the hieroglyphics of Egypt with the reasonable expectation of finding some valuable matter on methods employed.

Causes of Slow Development in Placer-Mining

Within the history of placer mining, there has practically been one advance, the development of dredging. This has put in the minds of a great many people the idea that placer mining can be conducted only in one of two ways; either by hydraulic operations with the sluices which usually accompany that form of mining or by dredges. This impression is altogether wrong and has unfortunately been the cause of a great deal of useless investment, besides stopping the growth of the placer-mining industry in directions which at this time, because of neglect in the past, offer more opportunities than any other.

In the ordinary lines of endeavor, it is hardly considered as showing either knowledge or good judgment to hire a plumber to put on a shingle roof. In carrying on mining operations, such incongruous combinations are not infrequent, and it is the rule rather than the exception that the man who is put in charge of mechanical plants for doing placer mining, other than dredging, has no more to recommend him for the position than the fact that he has done placer mining. There are numerous instances, even more extreme, of men put in charge who had never done placer mining but could run machinery.

There are a great many placer properties which have to the eye of the ordinary observer all the requisites for financial success. This is true, not only of properties which seem suitable for hydraulic work, but even more so of those which might be considered for dredging. Just why they eventually prove unsuccessful is not always understood by the stockholders and frequently not understood by even the management, except that they can figure easily that there is no more money available and can reason, therefore, that they must be spending it faster than they are taking it out—not an indication of profit. The outside specialist sometimes called in at this stage often refrains, through politeness, let us say, from expressing the feelings aroused by what he finds.

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I have spent a good many years in following the development of placer mining, dating from the time the first practical dredge of the American type was built. The conditions shown therein have been, if anything, worse than those shown in lode mining, due, no doubt, to the greater attractiveness of mining gold and to the generally accepted idea that placer mining is a much simpler undertaking than the other. In the earlier days of mining this was undoubtedly so. And the impression reasonably follows from the stories told by early prospectors in the Rocky Mountain region. To hear an old-timer in California Gulch say that when he could not clean up $100 a day with a pick and shovel and a long tom, he would move to a new location, is impressive; while to hear of a man cleaning up $800 in one day is sure to make a live man think of the possibilities which might result from more modern methods of doing the work. He is thoroughly surprised on investigation to find that "there ain't no such animal," the modern methods of doing the work being the methods of 1860, of 860 and, we might pretty nearly say, of 60 B.C.

All of this may sound somewhat facetious and a good deal like the wail of the disappointed office-seeker in speaking of his successful opponent, but, as a matter of fact, the premises is easy to prove, while at the same time, the proof is worth while, since there are actually great possibilities along legitimate lines, possibilities worth many times the effort being put on them today or for a number of years past.

Failure to Handle Semidry Placer Properties Successfully

Between the placer-mining property which can be successfully worked by pick and shovel and that which can possibly be worked by dredging, there is a vast amount of ground which carries a good gold content. This is particularly true in the arid countries where little or no water is available, but it is not by any means limited to such regions. Some of these properties have been equipped for operation, but lack of knowledge of methods has made them altogether unsuccessful and has unjustifiably laid the curse of failure on them. Many of them are in the hands of people who have neither the means nor the connections to develop them, and who fail to understand the increase of value which proper development would give, holding them at a figure entirely beyond their legitimate value. For these reasons also, there have been numerous failures in attempting to equip these properties and this has discouraged many people who might otherwise be interested and who could be interested provided one real success could be shown them.

In considering all these causes of failure, the one most evident can be classed under the general head of ignorance. This is no disparagement of the men who tried, since they unquestionably did the best they knew how, but the difficulty is that they did not know how. The mechanical equipment for any mining property is expensive and in most cases its success or failure cannot be determined until it is fully installed and ready for operation, which practically means that the initial investment is complete. In a great many instances, this entire work

has been placed in the hands of men who were thoroughly competent in mining operations, so far as their experience had gone, but who were infants in matters relating to mechanical equipment. It is one thing to know what is to be done, but it is an entirely different thing to know how to do it. The majority of mining engineers know what is to be done, but there is no large percentage of them with the experience needed to devise the means for doing it. A great many of them will claim that this statement is not correct, in which they are highly inconsistent, since it is only the rare genius who can be successful in two lines of endeavor so widely different as mining engineering and mechanical engineering.

In further argument on this point, a little consideration will show that the ultimate man in any mining work is the mechanical engineer. It makes little difference how successful a given method of treatment may be metallurgically or theoretically; to make it a commercial success the machinery involved must be adequate from every standpoint. Nothing affects commercial success more strongly than lack of capacity and the real basis on which to buy machinery is its capacity and ability to keep at the work with a high average efficiency. Obviously, to provide these requisites is an essential function of the mechanical engineer and it certainly would seem to be a most decided mistake to leave their determination to a mining engineer, whether he has obtained his education in a school or in practical work.

General Methods to Be Followed

There are two principal sources of loss in placer mining, fine gold and black sand. In the early operations the average recovery probably never exceeded 50% of the value of the gravel, certainly not more than this if there is any fine gold or black sand carrying gold. In this present day the losses are likewise from these sources, either one or both, depending on the region, and one of the curious features of the methods which have usually been tried is that, generally speaking, they do not seem to have learned anything from the development in lode mining, which has been so great in the last 25 years. To compare placer gravel and ore might seem to some people as rather far-fetched, and yet, the object of crushing and grinding ore is to bring it to the state in which nature has left the placer ground. It would seem reasonable, therefore, to treat gravel in about the same way that crushed ore is treated. As a matter of fact, this is being done, but only within the last few years and apparently following my efforts to make people who are interested in placer mining think along these lines. Success, however, is uncertain in such work, one reason being that the machinery developed for handling crushed ore is not successful when applied to the round particles of placer gravel, neither is it entirely successful in making marketable concentrates from the black sand; in fact, while ultimate success will be obtained, there is not now, so far as generally known, at least, any commercially successful installation.

Money Must Be Spent for Equipment

The most promising field for the development of machinery is that in which water is available only in small quantities, as when pumped from a well or derived from springs. Equipment for use in these regions must be such as to permit the water to be settled and used over or as to require no more water than that easily available. There are large areas in the southwestern portion of the United States which come under this general class. Some regions have exceptionally rich material, and many show material which it would seem might easily be worked with profit. It has never, however, seemed possible to take up the development of these properties except in a few instances, since the general investing public seems to be so filled with the idea that placer mining, unless done by means of dredges, should require a comparatively small investment in machinery. This is a wrong impression and inconsistent, as is proved by experience in practically every line of business. It makes little difference what the business may be, there is always a definite relation between the cost of equipment and its efficiency. If, then, we are to put in equipment for handling this class of ground on an economical basis, we may expect that the investment will be in about the same ratio as for dredging. It does not work out, however, that costs can be brought to the low figure which has been found possible in dredging work, the principal reason being that machinery of this class cannot handle the enormous quantities of gravel, while the total labor cost is practically the same in each case. There is some advantage obtainable from the fact that the work is always in plain sight and is easily prospected ahead so that there need be no waste of effort, while the dredge is always working under water and must handle enormous quantities in order to overcome the lowering of efficiency when handling gravel which does not pay its own expenses. There is also the further economy of not having to go into the bedrock in order to insure a cleanup.

Excavating

This statement applies more directly to the excavator required, preferably a steam shovel, and in view of former experience with the disadvantages of the A-frame type there would appear to be a great many advantages and possibilities in the more recently developed full-circle-swing shovel. The older type could not swing more than 90° from its direction of movement, which made it out of the question to have the washing plant follow the shovel on the same track unless there were used what generally proved to be a cumbersome and elaborate conveyor. With the full-circle swing, however, a second car, carrying the entire washing plant, can immediately follow the shovel. At the same time, the shovel has a better radius of action, one which is as economical in time and certainly much better suited for the work. With a combination of this kind the work can be conducted on the same general lines as dredging, the whole mechanical plant moving along as a unit, digging its way at the front and filling in behind.

Roughing Treatment

The process of recovering the gold in a plant of this kind has been just as much of a problem as the excavating. In many places it is absolutely out of the question even to consider screening, since the gravel must be washed through the screen; it is seldom dry enough under the surface to be successfully dry-screened. A screen, furthermore, to handle the gravel as it is dug, must be a heavy and cumbersome affair and, worst of all, it must be set at a considerable height in order to give the fall needed in every gravity method of concentration. A number of machines have been devised to do this work, the later and

most promising ones using some sort of a conveying device to get rid of the oversize and at the same time to effect a preliminary concentration. This seems to be working along proper lines and particularly so when the machinery is of ample size so that the material is handled at slow speed. Too much agitation is not permissible; there should never be enough movement to cause a current which would carry with it any of the gold.

The product from this device would be frequently in condition to be treated on a suitable concentrator. It would probably be necessary to provide a gravity screen to take out the small percentage of oversize which is certain to be present, but this is not a complication that need worry anyone.

The concentrator, as stated, must be one particularly adapted to the work. There are a few instances where some of the standard shaking tables have worked, but there are a great many more where they have been commercial failures and some where they have been mechanical failures, all going to prove that placer gravel is subject to local variations just as ore is. Quite recently this matter has been taken up by some of the concentrator manufacturers with the assurance that they were going ahead until they have worked out the problem, and there are one or two machines on the market which have already achieved some success along somewhat different lines from the ordinary.

A Case in Point

To illustrate the matter, the case was brought to my attention a short time ago of an installation, all of which showed how little has been the development in this direction. The property concerned which is the Cunningham Mesa Placer of the Ortiz Mine Grant in New Mexico, is extensive, but has only a limited supply of water, while other conditions make dredging impracticable. Effective prospecting has shown a gold content which is attractive and the plant which was installed handled about 10,000 yd. of gravel, enough to show the possibilities of an installation which might be used. The gravel was dug by means of one of the full-circle-swing shovels and loaded into cars which carried it to a fixed washing and screening plant, an ultimate distance of ¾ mile, dumped without wash water onto a bar grizzle, having ¾-in. spaces, the oversize going to dump cars for conveyance to the tailings pile, the undersize falling into a large bin. Gates in the bin bottom fed a 10-in. sluice 150 ft. long fitted with block riffles. No quicksilver was used and the bulk of the saving was in the first 50 ft. of the sluice as in the usual case.

The water supply was pumped from an old mine, the raise being 200 ft., pumping being carried on during the day only. The tail water was settled and cleaned by passing through brush dams and approximately two-thirds of it returned by pumping, the lift being 90 ft. making the resultant available water for the sluice about 325 gal. per min., for nine hours.

With this plant the screened product of from 175 to 225 yds. of gravel was easily handled, this being all that the excavating and conveying equipment could deliver. It could, however, have handled 300 yd. if that amount could have been dug and transported.

The cost of handling the gravel from pit to tailings pile was estimated to be 22c. per cu.yd. and the installation was in the nature of an experiment to determine definitely the cost of the work under practical conditions as well as definitely to check up the value with that obtained through prospecting. As a matter of information it developed that with a saving which has been given as approximately 70%, this cost was a trifle more than the recovery.

The losses were from two principal sources. Owing to the small water supply, it was out of the question to wash the gravel through the screen, consequently there was a considerable loss of gold which would not separate from the coarse material; there was a loss also from lumps of fines which stuck together and would not pass the screen and from masses of the material which did not separate, an unavoidable trouble where a large quantity of material is dumped on a screen which has no motion to break it up. In addition there was the loss in the sluices of the fine gold as a result of the velocity of water required to carry over the coarse gravel and in addition, the loss of any black sand which might carry metal. These losses can be very largely corrected by mechanical improvement and of course the first and probably the greatest loss, that on the screen, would be entirely done away with if sufficient water were available.

The thing of most interest in this plant is that handling such a small amount of material under conditions which are anything but economical a cost as low as 22c. per yd. could be reached. No other factor so seriously influences work of this kind as low capacity. Office expenses and labor cost on a plant handling 500 yd. per day would total little more than a similar plant to handle 100 yd. The other overhead charges, of course, would vary in the two plants but would be proportionately larger in the smaller one. In addition to these there is the cost of transporting the gravel from the excavator to the washing plant and of transporting the oversize again from the washing plant to the tailings dump. The total of this charge is reduced to the cost of operating an elevating conveyer in the case of a self-contained plant and would not be a fraction of the other. A washing and screening device would eliminate almost the total screen loss and altogether this property would seem to be a rare one for profitable development in the light of what has been done in the five of six years since the above plant was operated.

Ordinary riffle sluices were installed for recovering the gold. The loss from these tailings ran 50% to 75% of the content, the first loss being due to the fact that it was attempted to screen the material just as it came from the ground, using no wash water, and a good deal of fine material stuck to the coarse. The loss in the riffles was increased because the old-fashioned booming was practiced, which consists of allowing the screen gravel to accumulate and then letting in a large quantity of water, always an inefficient method. The best results from this installation are in showing actual costs, which make it almost sure that a profitable plant could be installed.

Labor Required

There need be nothing complicated about an installation of this kind. One requisite, of course, is to have a thoroughly good man on the steam shovel, since it must do its maximum at all times, and this means also keeping it in good repair. One other man with brains and some mechanical ability would be all the high-priced help re-

quired, everything else being arranged about the same as for the usual mining plant, not forgetting that the blacksmith must have the usual versatility. A careful estimate and comparison of costs show possibilities in this particular field that are well worth investigation and which should easily be realized by earnest and competent effort.

Placer Mining in Victoria

The production of gold by placer mining in Victoria declined in 1913, although the yield per cubic yard of gravel was slightly greater than in 1912, according to the report of D. B. Sellars, engineer in charge. A production of 65,433 oz. of gold was obtained from 16,796,585 cu.yd. The yield of gold per cubic yard of material treated was 1.9 grains as against 1.8 grains for the previous year. In 1912 the total quantity of material treated was 19,722,227 cu.yd., which yielded 73,781 oz. The quantity of tin won in 1913 was 32¼ tons, valued at £3884. There were 51 bucket dredges actually working in 1913, 26 hydraulic-sluicing operations using centrifugal pumps and 15 jet-elevator operations, a total of 92 operations which are classed in this report under "dredge mining"; there were five hydraulic-sluicing plants working by gravitation, making a grand total of 97 placer-mining plants in operation.

The 51 bucket dredges worked for an aggregate period of 1905½ weeks, raised 14,946,933 cu.yd. of material which yielded 52,211½ oz. of gold or 1.6 grains per cu.yd.; 7¼ tons of tin valued at £844 were also recovered. The acreage treated by dredging was 498 and the quantity of gold saved per acre was 105 oz. The dredge which treated the most material won 1271 oz. for 52 weeks' work from 21.7 acres of ground, yielding 0.8 grain per cu.yd. of material treated. The average weekly return of gold per plant was 27.4 oz., and the weekly expense, including maintenance and repairs, averaged £78 14s., a sum equivalent to 19.7 oz. of gold. The largest weekly turnover of material by any dredge was apparently 14,000 cu.yd.; four others each handled more than 13,000 cu.yd. and two raised over 12,000 cu.yd. weekly. The 26 pump-sluicing plants which are classed with the dredge output operated for an aggregate period of 280½ weeks, handled 1,191,817 cu.yd. for a return of 8957½ oz. of gold, or 3.6 grains per cu.yd.; 25 tons of tin valued at £3040 were also obtained from these operations. The largest pump-sluicing operation handled over 9000 cu.yd. of material per week; another plant treated over 7000 cu.yd. per week and two others each treated over 6000 cu.yd. per week. Fifteen jet elevators, also classed as "dredge mining," worked during 1913 an aggregate time of 213 weeks, handling 567,273 cu.yd. for a return of 3665 oz., or 3.1 grains per cubic yard of material treated.

The five hydraulic-sluicing plants working by gravitation treated 90,562 cu.yd. for a return of 599 oz., or an average of 3.17 grains per cu.yd. The aggregate number of weeks worked was 64, and the area 4.3 acres, the quantity of gold saved being at the rate of 139.5 oz. per acre; the highest yield was 315 oz. from 1½ acres. The five plants employed 31 men.

Most of the dredge-mining operations were in the Beechworth and Castlemaine districts; of the 92 operations, 49 were in the Beechworth district and 19 in the Castlemaine; Ballarat had nine operations, Gippsland six, Maryborough five, Bendigo three, Ararat and Stawell one. The total amount of gold that has been won by placer mining in Victoria is estimated at 1,059,604 ounces.

Mining in Baja California

SPECIAL CORRESPONDENCE

Mining as well as all other business has been at a standstill for the past six months, and although a general feeling of confidence and security is more apparent now than at any time during the year, local conditions prevent the resumption of activities. Until a uniform currency is established all over Mexico, including Baja California, and until the transportation of merchandise on the gulf is made possible, little or no progress can be made in this section.

The merchants are compelled to accept local money which was printed in La Paz on a cheap grade of blotting paper, and resembles street-car transfers more than it does a medium of exchange. Besides this, it is not negotiable in other parts of the republic nor even in the northern section of Baja California. As very little is produced here but leather and *panocha,* most of the supplies must be brought in from other parts of Mexico or from the United States. As the merchants must receive the local money for their local sales, and cannot purchase with it, the result is that their shelves and warehouses are empty and their safes well filled with this paper.

The Mexican government has taken possession of the properties of the Cia. Minas del Triunfo. These include, besides their own mines and hacienda at Colombinas, the mines and hacienda of the Progreso Mining Co., which were leased to the Cia. Minas del Triunfo two years ago. There are 1800 pertenencias in all, 1100 of which belong to the Progreso Mining Co. Both haciendas are idle at present. This company had commenced the installation of a 400-hp. producer-gas plant to generate electric power for the mines. The plan was to unwater and ventilate some of the rich deep mines by communicating with a perpendicular shaft, El Vaso. This was to be sunk 200 ft. deeper to open up the Humboldt vein on the 17 level. As the Humboldt is connected with other important mines, those that would be drained would include La Fortuna, San Pedro, San Pablo, Malacate, San Nicholas, Humboldt and Ninety Nine. These mines have produced about ten millions of dollars, and with the new power plant and an expenditure of $150,000, they would again become large producers.

Besides the above mentioned mines there are many others, and in all there are about 50 miles of underground workings. The Triunfo vein is six miles long and the Gobernadora and San José veins nearly four miles long, uniting with the Triunfo vein close to El Vaso shaft. In fact, El Vaso shaft was started about 25 years ago to cut the formation about at the intersection of the two veins, but for some reason or other, the work was abandoned when within 200 ft. of it. With the completion of the sinking of El Vaso shaft, the Triunfo district should become one of the most important mining districts in Mexico. The values are in gold and silver. Included in the Progreso claims there are 300 pertenencias covering innumerable parallel gold veins of arsenopyrite, carrying about 1 oz. per ton and perhaps ½ oz. of silver. Mining

in the Triunfo district has been pursued extensively for the past 40 years as the mountains of mine dumps will prove. About two million tons of these dumps would make profitable concentrating ore. As stated above, all these properties are to be operated by the Cia. Minas del Triunfo as soon as the government releases them.

The San Juan Reduction Co. has also been shut down for the past six months. The plant is in San Antonio, five miles east of Triunfo. The mine manager, J. C. Puttner, arrived here recently from Los Angeles. He had intended to start work again, but has been unable to do so on account of the delay in the arrival of his powder. This company treats its arsenopyrite gold ore by crushing dry in rolls and Hardinge mills, then roasting in superimposed-hearth, hand-rabbled furnaces and leaching with cyanide solutions. Their roasters were designed by their general manager, Paul Knappe, have given excellent results in roasting and are economical in fuel consumption, besides being easily and cheaply constructed.

David Lawrence is successfully operating a three-stamp mill and Deister table. Besides his own ores he has been treating custom ore from outlying districts.

There has been an awakening of interest in outlying districts south of Triunfo, and many small gold-bearing veins have been opened up. These are usually pretty rich, carrying coarse free gold, probably being the source of the large amount of placer gold found in the little *arroyos* draining that section.

A. C. Nahl and W. H. Rocholl are repairing the mill of the Mendoza Copper Co., at El Valle, for the purpose of testing a large mass of low-grade gold ore near by, about 12 miles south of Triunfo. This body is evidently a much-altered granite. The foot wall is granite and the hanging, hornblendite. It shows the effects of pressure, metasomatic replacement and impregnation. The chief secondary minerals are sericite and chlorite, replacing feldspars and mica. The deposit is particularly interesting on account of the vast tonnage of gold-bearing mineral. It carries free gold and sulphides, but only traces of silver.

Altogether, the future of this section of Baja California is exceedingly promising, but better transportation and a uniform currency are indispensable for the development of the mineral resources.

Arsenic in 1914

The arsenic market in 1914 was marked by no great changes or important happenings. The production increased slightly, but there was no great growth, and production may be said generally to be equal to the demand. American production acted as a balance wheel to the trade, increasing the demand for the commodity, and serving to keep the price shaken down to a standard which changes little or not at all.

The war had no noticeable effect upon the market here. The price continued about the same, and while there naturally was some trouble with shipments, the factor did not have sufficient influence to make any noteworthy change. So uneventful, in fact, was the market in arsenic that what could have been said about it six months ago can be said now with equal truth.

The sources of supply were about the same as last year. Mexican shipments continued to be interfered with by political troubles, but were somewhat increased over last year. Canada maintained the usual production, reduced output in some localities being offset by increases in others. The production of arsenic in the United States in 1914 amounted to 8,651,940 lb., as compared with 4,624,140 lb. in 1913.

Corocoro Copper District of Bolivia

By F. A. Sundt*

Corocoro is the most important copper district in Bolivia. It is now connected with the coast by the new Arica-La Paz R.R. Corocoro is 339 km. from the port of Arica, and its altitude is 4000 meters.

Native Copper Ores Worked for More Than a Century

Today there are only two important mining companies, the Cia. Corocoro de Bolivia, a Chilean company founded in 1873, and the Corocoro United Copper Mines, Ltd., a French company with headquarters in Paris.

The production of *barrilla* by the Cia. Corocoro de Bolivia is 1800 tons per year and the tenor of this *barrilla*, 84%. The *barrilla* is obtained from native copper ores of an average tenor in this company's property of 4%. The native copper is nearly pure and for this reason is sold in Europe at a premium. The *barrilla* is shipped chiefly to Havre, France, Livorno, Italy, and at times to Liverpool and Antwerp.

The Arica railway has brought about a considerable development in Corocoro during the last year. Before this railroad was built, the *barrilla* was sent to the coast through the port of Mollendo in Peru; the journey was long, required various transfers at Lake Titicaca and at the Rio Desaguadero. Today the *barrilla* is loaded in railroad cars in Corocoro and goes directly to the docks at Arica, with the great advantage of no breaks in the sacks or other important losses. Another of the great advantages of the railroad to Arica is that today the copper sulphides that occur abundantly in the veins can be exported without concentration.

Sulphide Veins Will Be Worked

The district contains many copper veins; for more than 100 years only the native copper ore has been worked. The sulphide veins were not touched because it was impossible to export the crude sulphide ore by way of Mollendo, on account of the difficulties of transport. At times there were not enough llamas and at other times the Rio Desaguadero contained very little water and, of course, the freighting was expensive.

The native-copper veins also contain ruby copper ore (Cu_2O); the *yanabarras* veins, as they are called in Corocoro, are accompanied by green sulphates. The *yanabarras* are the black sulphides without iron that correspond to chalcocite (Cu_2S) and are found in an arsenical gangue. The sulphide ores lend themselves to concentration; but this company has limited its efforts to the exportation of *yanabarras* and sulphates carrying 18% or more. There are veins of *yanabarras* that have a width of 9 m. with an average grade of 5%. These are not yet touched, as the company hopes first to study a method of

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concentration. The Cia. Corocoro of Bolivia was exporting in November at the rate of 1500 tons monthly of ore having a grade of 18%. The green sulphates of copper have little depth and at a few meters one encounters the unoxidized *yanabarras.*

As the European war does not permit sending the ores to that continent, the company is today selling its ores tc the American Smelting & Refining Co. and sending them to Perth Amboy, but it does not feel able to do the same with the 85% copper *barrilla* because the tariff is not satisfactory.

New Capilla Mine, Richest in Corocoro

The company recently opened another mine, the Capilla. Its native-copper ores are the richest of Corocoro, having an average grade of 7%. The mine is opened to 200 m. The Remedios mine is the deepest mine of this company having a vertical depth of 500 m. At this depth the veins still maintain their grade. The shafts are vertical, the veins having a dip of about 80°. All the shafts are rectangular in section, double compartment, and timbered with Oregon or California pine.

The Cia. Corocoro of Bolivia has only developed part of its territory. In one section of the property the deposits have been opened by tunnels and vertical shafts for a distance of 1300 m. along the strike of the vein and have been exploited to a depth of 150 m. It is shown that the mineralization continues in depth. In another part of the property, the Remedios mine to the south at 500 m. and the mines of the neighboring company at a similar depth have excellent ore. With these showings, the shaft of the Capilla mine was sunk to a depth of 200 m. in 1914; a Bleichert aërial tramway was installed to connect it with the mill, and in four months the Capilla mine production paid for the installation. The company is beginning another shaft 400 m. to the north, on the strike of the vein, and feels sure of encountering good ore, having already ordered another ropeway for this mine.

With the Arica railway connection completed, the company is now able to change its power installation. Up to the present, it has employed steam power, using as fuel *taquia*—llama dung—but the company is now installing Diesel crude-oil engines. A horsepower-hour from *taquia* costs approximately 3c., U. S. Cy.; from oil it will hardly cost 1c. The company expects to save the cost of the new installation in the first year. The milling machinery and the hoist will be operated by electricity.

The Corocoro camp is of much interest by reason of its native copper ore, and on various occasions North American capitalists have endeavored to invest in the district; lately the Amalgamated Copper interests have inquired regarding property, but the present status of the negotiations is unknown. The Corocoro camp has been worked more than two hundred years, but during this epoch only native copper ore was extracted. The sulphides and sulphates of copper were not touched; for this reason the company has had the good fortune of beginning and working practically from the surface.

The government of Bolivia is liberal in its tariffs and the crude ores do not pay export tax. Lately also the taxes on sacks for the *barrilla* and crude ore have been taken off; all mining machinery enters Bolivia free of duty. The freights from Corocoro to Arica for a ton of ore, including all expenses to the side of the vessel, are $4, U. S. Cy. The export tax on copper *barrilla* varies with the value of the product: On *barrilla* valued from £50 to £60, the tax is B. 1.40 (one boliviano equals 18d.) per 100 kg.; from £60 to £70, the tax is B. 1.61; from £70 to £80, the tax is B. 1.82. The wages of the miners are low in Corocoro; a man makes on an average B. 2 per day; the women, who also work in the mine, make B. 1 as *apires.*

Copper Costs £35 per Ton

The cost of producing copper, including all expenses up to the sale in Europe, is £35 per long ton. This is excellent considering the small scale of operation, the production having been reduced to 1800 tons of *barrilla* per year. But the real cause is that the native copper is easily concentrated to an 85% product, which is sold, without the expense of smelting or electrolytic refining, at a price superior to standard copper. In spite of the war the company is working at the usual rate, the low costs leaving no danger of loss in selling.

When the Cia. Corocoro de Bolivia has finished its installation of Diesel engines, it expects to produce copper at £30 per ton. One of the difficulties the company has had in augmenting its production was the scarcity of workers, the tin mines having taken the larger part of the miners of Corocoro by paying higher wages. However, it is expected that many Indians formerly engaged in securing and selling *taquia* will be released from this work when the mines begin to use oil for the production of power; the two leading companies in Corocoro have paid £25,000 annually for the collection of *taquia.*

The Zinc Situation at Broken Hill

At the recent meeting in London of the Sulphide Corporation, the chairman gave an interesting review of how the outbreak of the war had affected the lead- and zinc-mining companies of Broken Hill. He said:

For generations Germany has cultivated and almost monopolized the industry of zinc distillation; the majority of the works which treat Australian zinc concentrates are situated in Germany, and the sudden closing of the German market for this class of material was an almost paralyzing blow to Broken Hill. We, perhaps, are in a slightly better position at the present time than some of our neighbors, because we have the works of the Central Zinc Co., in England, by means of which we have still an outlet for some portion of our production, but this portion is not very large. During the last two years we have produced 131,316 tons of zinc concentrates, and of these 19,633 tons have been treated at the works of the Central Zinc Co., while 116,296 tons have been sold at Broken Hill to Beer, Sondheimer & Co., of Frankfurt, under contracts which have been running for many years. These contracts were, of course, brought to an abrupt stop at the beginning of August. The expansion of the Central Zinc Co.'s works, owing to the great difficulty in finding in England an adequate supply of skilled labor, can only be gradually carried out.

For the mines not possessing lead smelting works of their own there was also, on the outbreak of war, an immediate difficulty in disposing of lead concentrates, a large proportion of which had been previously sold under contracts to German buyers. This difficulty did not arise in our case, owing to our having a sufficient smelting establishment at Cockle Creek and contracts of long standing with an English company for the disposal of bullion. It has been overcome also in the case of most of the other mines, as they have now been able to arrange for the smelting of their lead concentrates at the works of the Broken Hill Proprietary at Port Pirie, they being considerably larger than is required for the proprietary company's own output. At the beginning of August there was so much uncertainty as to whether it would be possible for the mines to be worked at all under the new conditions without heavy loss that we suspended

mining and milling operations for three weeks, although we kept our Cockle Creek smelting establishment in full work, converting our accumulated stocks of lead concentrates into bullion. We realized, however, that it was our duty, if possible, to continue work also at Broken Hill, where a complete stoppage of operations would have inflicted very severe hardship and distress upon the large mining population, and especially upon those who were married and had made their permanent home at Broken Hill. We, therefore, tentatively resumed work at the end of August, and during September, October and November we continued to work the mine and mills alternate weeks, stacking the zinc concentrates produced and sending the lead concentrates to be smelted at Cockle Creek into lead bullion for shipment to our English contractors. So far as we can judge, we have been able, while doing this, to avoid loss and, thanks to a favorable lead market, to make some profit, so, at the beginning of December, we decided to increase our scale of operations at Broken Hill and to work the mine full time, at least so long as the lead market may warrant our doing so. We hope, therefore, that we shall now be able to make profits on a somewhat larger scale, and, as we are still without any substantial outlet for our zinc concentrates we have established a plant which enables us, whenever we find it necessary to do so, to dump the residues from our lead mill for future use, without passing them into the zinc mill and incurring the expense of converting them into zinc concentrates.

Australian Copper Production, 1914

By W. P. Geary*

The copper production for the Commonwealth will be approximately 34,000 long tons in 1914, as compared with last year's figure of 46,500 tons. Australia, like the rest of the copper world, has been seriously affected by the present European war, which has disorganized the metal markets for the time being, and also considerably reduced the price of copper. For the first six months of the year, the price of electrolytic copper was well over £60 per ton, and under normal conditions there was every reason to expect that the price would maintain a fairly high average which would stimulate copper mining to a great extent in Australia.

At the time of writing, it is interesting to note that the New South Wales government has decided to build the railway from Condobolin to Broken Hill, and we believe a start has already been made at the Broken Hill end. This railway should bring the Mt. Hope copper mine to a producing stage, as the chief difficulty of this property has been the heavy cost of transport. The Great Cobar, Ltd., has been closed down since April and has not resumed smelting since, development work only being carried on. Most of the smaller mines in New South Wales have ceased producing, owing to the fall in the price of copper and also the uncertainty of the market. This state's output should be 3500 tons.

Queensland will probably account for 18,000 tons this year, the chief producers being the Mt. Morgan and the Cloncurry fields. The Chillagoe, Ltd., closed down its smelteries early in the year, owing to the high cost of fuel and the slow progress made with the construction of the railway to Mt. Mulligan, whence the Chillagoe company intended drawing its supply of fuel. The Mt. Elliott, Ltd., has also closed its smelteries, being only engaged in development work at present, while the Great Fitzroy mines have been closed for the greater part of the year.

The Mammoth copper mine, in north Queensland, which promised so well in the early part of the year, has had to suspend smelting operations through the effects of the war.

Beyond Wallaroo & Moonta, there is not much of note in South Australia. This mine has been affected by the war, but should produce about 5000 tons of copper.

In Tasmania, the Mt. Lyell company is the biggest producer and should account for about 6500 tons. The other copper mine of note is Murray's Reward, which, under normal conditions, produced between 300 and 400 tons of copper per annum.

Western Australia should account for about 750 to 1000 tons, the principal copper fields being the West Pilbarra and Phillips River. In the latter district, the state government has recently erected smelteries for producing blister copper.

The properties in New Guiana are still in the prospecting stage and their production does not seriously affect the output of Australia.

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Pato's Proven Area Now 528 Acres

According to a preliminary report, recently submitted by W. A. Prichard, who has been conducting a drilling campaign at the Pato property, of the Oroville Dredging Co., in Colombia, the area now proven should give a life of 20 years at the present rate of working. Mr. Prichard stated that as a result of his additional drilling, he had been able to measure up on Oct. 1, 1914, a total of 528 acres outside of the area already dredged, and that the value per acre would be about the same as originally estimated for the tested area. He further suggested that with the exception of about a month or six weeks during the dry season, it would be practicable to run two dredges continuously on the Pato property; also that there would be plenty of power for 10 months in the year for three dredges, which would include the new dredge now being constructed on the San Francisco property of the affiliated Nechi company. Camp conditions have been improved and with the machine shop and additional tools, the equipment for the two properties is now considered up to the highest standard. A considerable saving in the operating cost of the existing Pato dredge will be brought about by the operation of the Nechi dredge, which will be worked under the direction of the same staff.

The Production of Rutile

The only rutile produced in the United States during 1914, so far as is known to the U. S. Geological Survey, was, as heretofore, that put out by the American Rutile Co. at Roseland, Nelson County, Va. The company produced 94 tons of rutile carrying 95% of TiO_2 and as a byproduct 89 tons of ilmenite carrying about 55% of TiO_2. The company did not operate its mill in 1914 until the middle of August. During the earlier part of the year the mill was thoroughly overhauled and new stamps and other machinery were installed. Large foreign orders could not be filled on account of the effect of the war upon commerce.

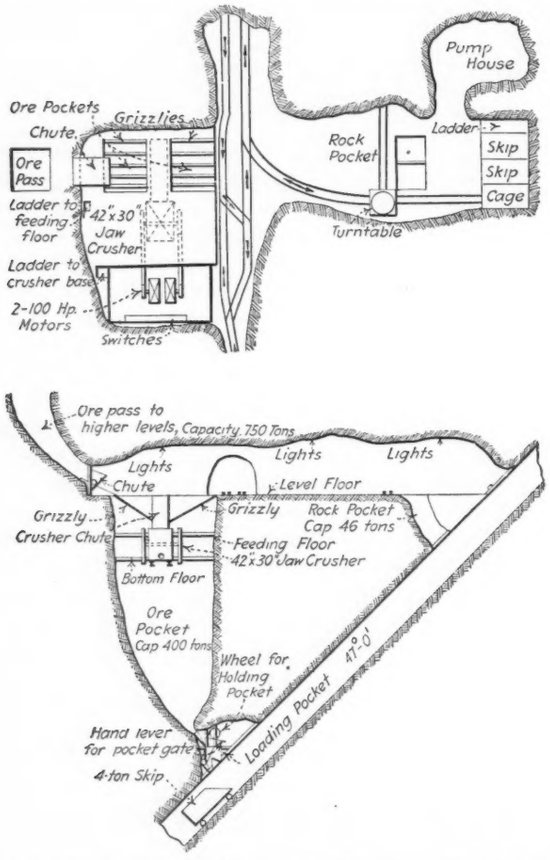
The rutile-bearing rock is worked in opencuts. Most of the rock worked came from a bluff near the mill, on the east side of Tye River, but some rock was also taken from the west side of the river. The rutile forms about 5% of the rock worked.

Details of Practical Mining

Underground Crushing and Loading Arrangements

By Albert E. Hall*

In order to facilitate hoisting and avert delays in tramming at the Creighton mine, Ontario, a change was made from dumping from the cars into the skips to dumping into a pocket. As the muck at Creighton comes through the chutes in large pieces, a pocket previously



Figs. 1 and 2. Arrangement of Underground Station

tried proved unsuccessful, since after drawing the muck from the chutes it would block in the skip-loading chutes and have to be drawn all over again. For this reason, and also because the rockhouse crushers could not handle the large material, making blasting and long stops necessary in the rockhouse, an underground crusher was installed.

A separate pocket is provided for rock, which is smaller than the ore pocket. When the rock pocket is filled, the regular hoisting of ore is interrupted and the pocket emptied. The only change necessary is the opening of the rock dump in the headframe, which is done in a few minutes by the surface skiptender when the signal for hoisting rock is rung. Tramming of ore goes on just the same while rock is being sent up.

All ore is hoisted from the large pocket on the lowest level. The shaft has four compartments, but only two of these are used for hoisting ore, and the two skips work in balance. To get the ore from the levels above, a large raise, known as the ore pass, was put up. At the bottom of this is a heavily constructed chute with a gate consisting of inclined rails on each post and a cross-timber. The chute feeds onto a 10-in. grizzly, which in turn delivers to a chute at right angles to itself. This chute feeds the crusher, and on the side opposite the chute grizzly, there is another grizzly, also 10-in., to take the muck from the cars on the level. A plan of the arrangements is shown in Fig. 1, while a cross-section appears in Fig. 2. It may appear that the construction is heavy, but it must be remembered that the ore to be handled is very heavy, being for the most part pyrrhotite mixed with a little chalcopyrite and a small quantity of pentlandite. In addition to this, the material to be handled is very large. It might appear that the grizzlies and crusher chute have little inclination, but it must be remembered that the material strikes them when it has considerable velocity and retains enough momentum to carry it to the crusher. Were they any steeper, the crusher would be blocked frequently.

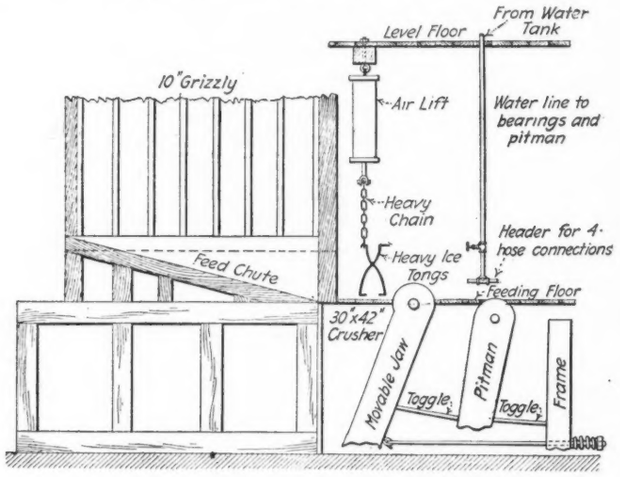


Fig. 3. Arrangement of Crusher and Bin

In connection with the grizzlies it can be said that various types of rails can be used. The ordinary railroad rail is all right if placed with the large side up, but cannot be used if placed in the usual method, as pieces which will pass the top will not pass the larger flange on bottom, and trouble will be experienced in keeping the grizzlies clean. Instead of turning the rails upside down, the large flange can be trimmed off, but in the present case this made the rail too weak. Another type of grizzly rail tried is an I-beam with a hardened plate on the top. This worked fairly well, but the material is also inclined to stick at times in this, and these are not as good as a rail with the top decidedly bigger than the bottom. A

*Mining engineer, Creighton Mine, Ontario.

round shape or one of triangular shape with the large side up and the point of the triangle down works best.

The pocket holds about 400 tons and the ore pass will hold about 750 tons, so together they have a considerable storage capacity. The pocket is provided with a hand-operated gate of the arc type, with the convex side toward the muck. It moves up to allow the flow of muck into the loading pocket. The skips hold 4 tons and so do the loading pockets. The gate of the loading pocket is operated from the same floor as the gate of the main pocket by means of a pilot wheel and chain and sprocket. The front of the skip is made lower than the other three sides to facilitate even loading, and a depression in the rail serves the double purpose of acting as a skip chair and taking the load off the rope, so that the skip does not go down as it is loaded, and it also gives the skip a steeper inclination, making more complete loading possible. A block with rail to fit can be swung into the chair when it is desired to take the skip to the levels being developed below. The loading pocket is built of boiler plate and was constructed on the surface, taken down in one piece and put in place.

The arrangement of the crusher is seen in Fig. 3. It is a Farrel crusher of the jaw type. Two heavy 18-in. I-beams run across the pocket and are cemented into hitches, making them very solid and giving a firm foundation for the crusher. All the timbering in the pocket to support the grizzlies and crusher chute is 14x14 in., and is protected from wear by boiler plate. The crusher is 42x30 in., and is set to deliver 10-in. material. Two 100-hp. motors are needed to run it. No oil is used in the operation of the crusher, a water pipe having been provided with connection to each bearing and to the pitman. Grease cups are used in addition.

Once in a while a large boulder will get wedged on top on the crusher jaws, and then an air-lift provided with a chain and a pair of ice tongs proves valuable, and a great time saver. A large piece can be swung to fit the opening in a short time, whereas it would be impossible to bar it through and blasting means a great loss of time, since in addition to the preparation of the powder, etc., all the electric lights must be taken out, and even then the wires may be injured. If the piece is very large, enough powder to break it cannot be put on the boulder, as the crusher might be injured. The capacity of the crusher has never really been tested, as it is much greater than that of the hoist.

YEARLY DEVELOPMENT RECORDS, ST. LAWRENCE PYRITES CO.

TABLE I. DRIFTING

Year	Feet Advance	Drill-Shifts Piston	Air Feed Stoper	Jack-hamer	Labor-Shifts DR	H	M TR	Total Feet Drilled	Feet Drilled per Foot Advance	Tons Broken per Foot Advance	Drill Shifts	Per Foot Advance DR+H	M+TR	Explosives $
1911	1769	1187	102	0	1316	1306	1557	63,321	35.2		0.728	1.481	0.879	2.350
1912	2369	1197	48	0	1364	1241	2101	60,636	29.8	8.22	0.525	1.100	0.887	2.025
1913	1282	652	191	33	937	697	1365	45,830	36.5	9.84	0.675	1.274	1.064	2.182

TABLE II. RAISING

1911	1575	508	249	0	787	782	659	44,562	28.3		0.474	0.995	0.418	1.750
1912	1374	4	388	0	437	174	406	31,739	23.1		0.285	0.445	0.338	1.285
1913	79	3	40	0	44	0	21	1,550	19.6		0.55	0.56	0.270	1.320

per ton of the various items. To obtain these costs it is necessary to keep records from which to determine the proper distribution of labor, supplies and power or other elements entering into the costs and it is also well to include these distributions in the cost statements. Sometimes, in addition to the costs of the current period, the average of all periods from the beginning of the year is given to facilitate comparison. Such a statement, however, is not sufficient for the manager who is continually trying to decrease costs through increased efficiency. For this purpose it is desirable to have records eliminating variables such as wages and cost of supplies, so that true comparisons may always be available. Separate records of various parts of the mine, or even separate records of every working place, may be desired to check the work of one part against another.

TABLE III. YEARLY STOPING RECORDS, ST. LAWRENCE PYRITES CO.

Year	Tons Trammed	Tons Broken	Drill-Shifts Piston	Air Feed Stoper	Jackhamer	Labor Shifts DR	H	M	TR	CL	TM	Total Feet Drilled	Feet per Drill Shift	Tons Broken per Drill Shift	DR+H	DR+H+CL+TM	Feet Drilled	Tons Tr. per M+TR	M+TR+TM	Average Distance Trammed, Ft.	Tons Mined per Man	Total Explosives per Ton, Dollars
1911	95,391	93,512	3028	51	0	3523	3235	2718	4094	796	0	124,079	40.3	30.37	13.83	12.37	0.742	13.98	12.54	363	6.620	0.0893
1912	120,465	125,350	2409	1014	120	4525	2648	2248	6085	1968	332	182,402	51.4	35.37	17.47	13.23	0.687	14.45	11.69	539	6.907	0.0858
1913	119,128	118,025	0	1398	1421	3275	75	2647	5092	3238	510	189,169	67.1	41.86	35.23	16.62	0.580	15.39	10.85	462	7.993	0.0927

Key: DR = Drill runner
H = Drill helper
M = Mucker (loads ore into car by shovel and trams)
TR = Trammer (loads ore from chute into car and trams)
CL = Cleaner (cleans down ore in flat stopes to loading chute)
TM = Timberman

$$\text{Tons Mined per Man} = \frac{\text{Tons Broken}}{\text{DR+H+CL+TM+X}}$$

$$\text{Where X} = \frac{\text{Tons Broken}}{\frac{\text{Tons Trammed}}{\text{M+TR}}}$$

In most mines where drilling and blasting are done, it is customary to keep some record of the footage drilled each shift by each drill runner. This keeps account of the runner's work and shows the tonnage per foot of hole drilled. However, the tonnage broken per foot of hole in development work usually varies from that in stoping and it is necessary to differentiate between them. This is desirable also because in development work the object is the cost per foot rather than the cost per ton. The

Recording and Comparing Mining Data

By F. T. Rubidge*

It is customary in mining, as in any manufacturing business, to show the cost of producing in statements covering definite equal periods, and revealing the cost

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cost of either class of work will vary also with the size and inclination of the opening, character of the ground, efficiency of the labor and character and efficiency of the equipment.

In treating with the efficiency of the labor and equipment, progress is secured principally through experiment. For instance, it is practically impossible to forecast the best type of drill and mounting, the most economical placing of holes as to number, position, diameter and depth, best explosive, most economical method of handling ore in flat stopes, the best type and size of loading chute, best arrangement of crew or crews, effect of bonus giving, etc.

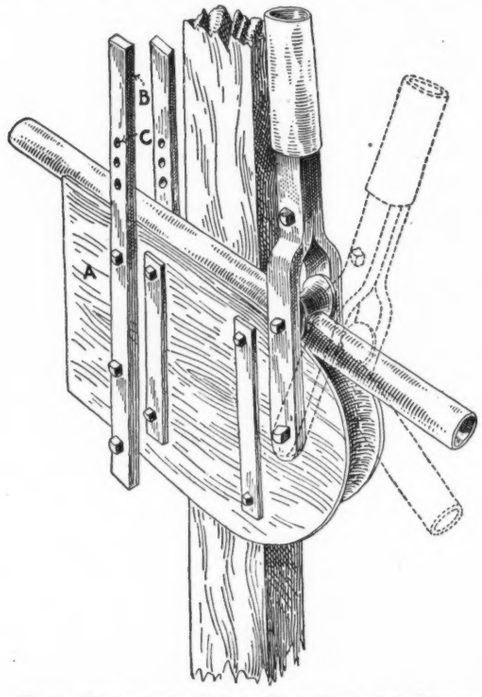
A system of recording such items, with the results obtained, is necessary to obtain full benefit from the tests. Having established the system, it is generally desirable to make it permanent, not only because the experimental period should never cease but because of the value to be derived from comparing results of similar working places in the mine and the monthly or yearly averages of each class of work as a whole. The value of such comparisons cannot be over-estimated, especially when copies of the monthly results are distributed among the men in charge of the various parts of the mine. Those showing the poorest results automatically receive a prod and those with the best are encouraged by knowing that their work is being recognized.

The data pertaining to the cross-section and inclination of the opening, the character of the ground, advance in development work and the tons broken in stoping, are preferably ascertained and recorded by the mine surveyor and appear only on the monthly or periodic summary. The recording of the daily data is intrusted to the foreman or shift-boss, and it is desirable to arrange the recording blanks so that the results may be inserted quickly and be both accurate and legible. Every working place in the mine should have some designating mark. The best system of marking is no doubt based on the coördinates established by the surveyor and used in conjunction with the numbers of the levels. Drifts are not easily so designated, but usually some other system based on location is available, such as 5B, FW, N for 5th level, footwall north on the "B" vein. Probably the most legible record is made with a punch on a form similiar to a street-car transfer. The application of such a system was discussed by me in the JOURNAL of Mar. 25, 1911, and some forms for the monthly summaries were also shown. There is some question, however, as to whether the punch system is better than the larger blank forms on which the data of all working places in each subdivision of the mine are entered in pencil on one sheet.

The information available from the monthly records is both interesting and valuable. From time to time special summaries must be made of each working place, to get the most from the data. The data for each stope, for instance, should be summarized on the completion of the stope, especially where the monthly results are inaccurate, due to the difficulty of estimating the broken ore in the stope at the end of each month. The annual summaries are not of much help in directing the mining work, but are nevertheless interesting historical records. The records (p. 193) of the St. Lawrence Pyrites Co. are interesting because they show the results obtained in changing drill equipment and from improvements in methods. It should be noted that the increase in the number of cleaner (CL) shifts is due to the flattening of the stopes, the cleaners being the men engaged in getting the ore in the stope down to the chute at the level, for loading into cars. It is also interesting to note that with the smaller holes drilled with the hammer machines less ore is broken per foot drilled, and the explosive cost is higher than with the piston type of drills; this result, however, was not unexpected and is more than offset by the difference in labor.

Pipe-Bending Device

In a plant where it was necessary to bend pipe of various sizes from 1 to 2½ in., the simple pipe bender shown did good work, writes W. E. Chandler in *Power*, Jan. 12, 1915. A 2-in. hardwood plank 18 in. long by 12 in. wide, rounded off at one end to a 6-in. radius, was fastened to a post in the shop. Two pieces of 1½x½-in. flat steel *B*, one on each side, and extending 5 in. above the top of *A*, had a number of ¾-in. holes for a pin to hold the various sizes of pipe. On the rounded end was fastened a swing-



PIPE BENDING FORM CLAMPED ON POST

ing arm or lever and roller held in place by a bolt through two pieces of 1½x½-in. flat steel, and pipe extensions of different lengths furnished the required leverage to bend the various sizes of pipe.

The method of operating is to hold one end of the pipe to be bent in the space between *A* and a pin in *C*, and bring the roller to bear slightly, then draw the pipe forward an inch or two and repeat the operation until the required bend to any number of degrees is completed. This apparatus is inexpensive, easy to construct and is convenient for making offsets and lateral bends.

In many mine repair shops, a satisfactory bending apparatus may be improvised by mounting eccentrically on a column two old tram-car wheels. Flattening of the pipe may be prevented by filling it with dry sand or flue dust.

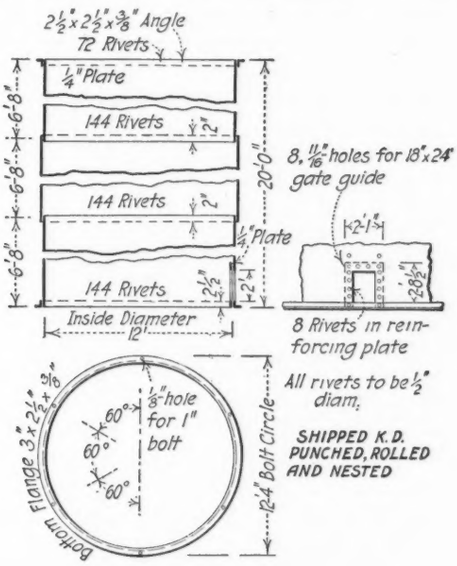
Details of Milling and Smelting

Steel vs. Timber Ore Bins

By Percy E. Barbour*

The usual type of timber ore bin is so familiar that we too often overlook the many advantages of the cylindrical steel bin.

The data herewith presented are from four ore bins in actual service; one of steel and three of wood. The 100-ton cylindrical steel bin described has recently been built at the Uwarra mill, at Candor, N. C. It is constructed of ¼-in. plate, is 12 ft. diameter and 20 ft. high, and stands on a concrete foundation recessed for the driving gear of a plunger feeder for a set of rolls. This is mentioned to show that the foundation cost is higher than otherwise would be the case. The dimensions and details of the bin construction are shown in the drawing. The steel for the bin weighed 10,000 lb., and cost 3.75c. per lb. The erection of this bin, including riveting, cost $32.14 and was done by green labor. The concrete foundation required 11 yd. of concrete which cost $7.50 per yd., and the foundation bolts cost $2. Freight on the ore bin amounted to $58.23, and the total cost of the bin ready for use was $549.87.



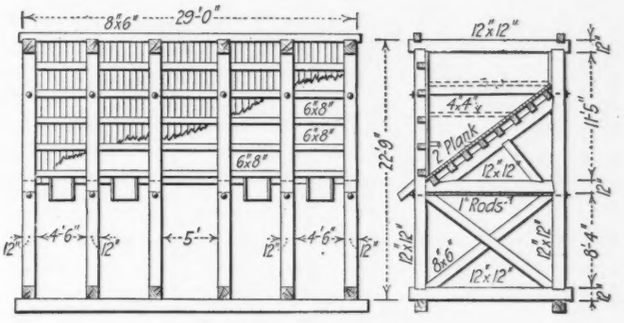
Steel Ore Bin

The 100-ton wooden bin was in use at the old Montgomery mill at Candor and was taken down and set up at the new Uwarra mill because it was too good to throw away and would cost only the labor of moving it.

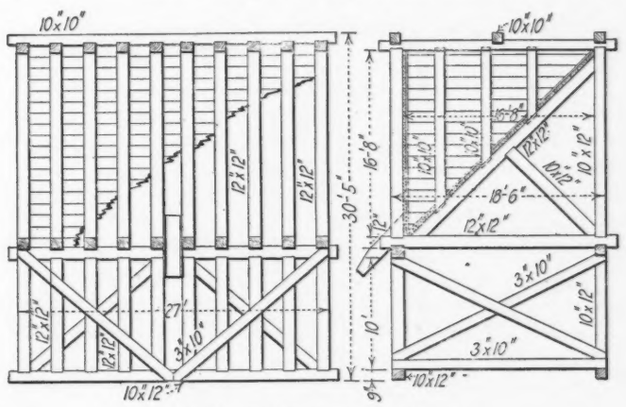
The 150-ton bin is at the loading terminal of the 3-mile aerial tramway of the Salt Lake Copper Co., at Tecoma, Nevada. The 350-ton bin is at the lower terminal of this tramway.

These four bins were designed by three minds, but the cubic feet allowed per ton of ore differ little, as will be seen by the table, and they average 23 cu.ft. per ton. To prevent undue influence of these slightly differing factors the costs have been figured out both per ton and per cu.ft. of capacity. The comparisons are not altered except in degree and that only slightly.

The cost of the steel bin in the table is the actual construction cost. The costs of the wooden bins have been estimated; the timber at $30 per 1000 ft. and the labor at the same figure per 1000 ft. for framing and erecting. This was the price of timber of this size and grade at Candor at the time the steel bin was constructed, hence gives the proper comparison. Probably this is as low as this timber can be purchased anywhere in this country today. It was found in our construction at Candor that the cost per 1000 ft. for labor for framing and erecting buildings and frame structures very nearly equaled the cost of the timber and lumber itself, which checks this way of estimating, now so commonly used. Two of these bins are tied with rods which, at 3c. per lb., increase the cost of the bin from 8 to 14c. per ton of capacity. For the purposes of this comparison that makes little difference. Nails and spikes would make a much less difference, and for this comparison may be safely omitted.



100-Ton Timber Bin



150-Ton Timber Ore Bin

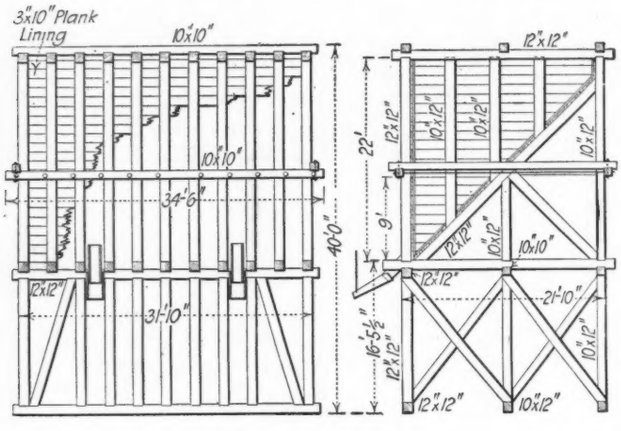
The table shows the cost of these bins and shows that the steel bin is the most economical as to first cost, both as per ton and per cubic feet of capacity. The 100-ton

*Mining engineer, 887 Middle St., Bath, Me.

wooden bin, which is the cheapest of the three wooden ones, cost 44½% more than the steel bin. Considering the elimination of the fire risk, the absence of dead corners and the concentration of gate discharge and finally the first cost, it seems as though the steel bin has not had the common and frequent use that it deserves.

Some comment may be made on the comparative types of construction of the three wooden bins. In the 100-ton bin the posts are far apart and 6x8-in. girts are dapped into them to support the planking, which is vertical. Spacing the posts far apart eliminates some posts. If they had been spaced at the close intervals used in the 150-ton bin, 5000 ft. more timber would have been required. This style, however, increases the labor required for mortising and dapping. The figures seem to show that this makes for economy in the total cost.

The 150- and 350-ton bins undoubtedly have a little more timber than is necessary, as all bins do, but they are very good bins nevertheless. The posts are spaced nearer than is actually necessary. The two larger bins



350-Ton Timber Bin

have the rear posts lighter than the front posts, which is good design.

Another striking difference in the design of the 100 ton bin and the other two is that the former has bents,

DATA ON THE ORE BINS CONSIDERED

	Cylindrical Steel Bin	Usual Type Timber Bins		
Nominal capacity, tons	100	100	150	350
Capacity of bin, cubic feet	2262	2389	3594	7565
Cubic feet per ton of rock allowed	22.6	23.89	23.95	21.6
Feet lumber and timber required	10,000*	13,000	23,000	47,000
Total actual cost	$549.87	....	....	....
Total estimated cost	....	$794.40	$1380.00	$2850.30
Cost per cu.ft. capacity	$0.243	$0.332	$0.384	$0.377
Cost per ton capacity	$5.50	$7.94	$9.20	$8.14

*Pounds of steel for metal bin.

each of which is bound together top and bottom into an integral section complete in itself. The other two bins have a shorter integral bent set up on what are in reality legs. This was made necessary by the height of bins required.

Increasing Battery-Screen Area

The area of battery screens may be increased by reducing the ends of the frames to a width of 1 in., and increasing the strength with a piece of $\frac{1}{16}$-in. sheet iron. In place of the regular wooden stay in the center of the frame, place a ⅜-in. bolt, shouldered and threaded at both ends, washers being placed at the shoulders. The bolt should stand clear of the screen. This gives a total of about 3 in. more screen surface than when the wire cloth is tacked to the ordinary heavy frames.

Selling Refractory Brick by the Ton*

In the past more or less confusion has existed in the matter of purchases and sales of magnesia and chrome brick used largely in the openhearth and copper-smelting processes. It has been customary in some cases to make a brick 9x4½x2½ in. as a standard, in other instances brick measuring 8¾x4⅜x2⅜ in. have been made. Nor has there been any uniformity in the method of making quotations.

Many users have been purchasing the 9-in. straights at a tonnage price and the sizes, such as keys, at so much per thousand. Others are buying entirely on the thousand basis while still others buy wholly on a tonnage basis.

In order to simplify this business the Harbison-Walker Refractories Co. has decided to establish for its chrome and magnesia brick a standard measuring 9x4½x2½ in. with the corresponding series of sizes, and, dating from Jan. 1, 1915, its regular form of quotation on all magnesia and chrome brick, whether standard sizes or special shapes, will be on a tonnage basis with a definite scale of extras given in the accompanying table.

MAGNESITE- AND CHROME-BRICK PRICES

Base Prices and Extras on		Magnesite Brick Per Net Ton	Chrome Brick Per Net Ton
Standard 9-in. (9x4½x2½)		Base price	Base price
Standard No. 1, 2 and 3 arch	per catalogue	$5.00 over base	$5.00 over base
Standard No. 1, 2 and 3 wedge	per catalogue	5.00 over base	5.00 over base
Standard No. 1, 2, 3 and 4 keys	per catalogue	5.00 over base	5.00 over base
Standard soaps and splits and feather edge	per catalogue	15.00 over base	15.00 over base
Special shapes—"Class A"—Rectangular shapes not exceeding 15x6x4 in. nor less than 8 in. in length, 4 in. in width or 2½ in. thickness, in lots of 1000 pieces or more		5.00 over base	5.00 over base
Special shapes—"Class B"—Rectangular shapes from 15 in. to 18 in. in length, 4 to 6 in. in width and 2 to 4 in. in thickness in lots of 1000 pieces or more		8.00 over base	8.00 over base

Prices on Class "A" and "B" shapes in less than specified quantities, or on specials not included in above, on application.

The quoting of a tonnage price throughout will not only avoid confusion but insure fairness in prices. A price per thousand pieces on brick made from an expensive commodity such as magnesite or chromite necessarily introduces the question of the weight of the brick. If sold on a tonnage basis the slight variations in size or weight automatically adjust themselves equitably to both buyer and seller. It is to be noted that the placing of definite extras per ton on the so called sizes such as keys, wedges, etc., does not actually raise the price per thousand, as their weight is considerably less than the straight brick. In the case of soaps, splits and feather edge at $15 extra per ton over the base price the cost is actually less than when purchased at a price per thousand pieces uniform with the 9-in. straights.

The scheduling of definite extras on what was termed difficult shapes will also tend not only toward fairness in prices but toward clearing up much confusion in the minds of the engineer and purchaser as to the relative cost of various types of design.

*From data furnished by the manufacturers.

Company Reports

Coniagas Mines

The report of the Coniagas Mines, Cobalt, Ont., for year ended Oct. 31, 1914, states that the total shipments from the mine during the year amounted to 2,497,394 oz. of silver which was contained in 484 tons of mine ore and 688 tons of concentrates. The cost of mining and concentrating was 12.444c. per oz. of silver and shipping, smelting, refining, and marketing, 3.585c., making the total cost 16.029c. per oz. The average price received for silver was 56.75c. per oz. During the year, in addition to dividends and bonus paid on Nov. 1, 1913, of $560,000, three dividends of $360,000 each were made up to Aug. 1, 1914, and a quarterly dividend of $240,000 payable Nov. 1, 1914, was declared. Dividends since Nov. 1, 1906, to Oct. 31, 1914, amount to $7,000,000 and the total shipments of silver aggregate 20,000,000 oz. of silver.

An average of 153 men worked throughout the year at the following occupations: 10 in mine office and supervision, 1 at camps and buildings, 2 in maintenance of buildings, 4 at camp expense, 3 on lands and roads, 97 mining, 7 on mine maintenance, 1 on drills, tools and hardware, 4 on mining contracts, 1 on fuel, oil and waste, 16 milling, 5 on mill maintenance, 1 loading ore and 1 sampling. As there were 62,595 tons of ore and waste removed during the year the average tonnage of ore and waste handled per year per man employed was about 410 tons. Development work during the period amounted to 2295 ft.; a total of 25,003 ft. has been driven to date. Ore reserves are estimated to contain 11,904 oz. of silver, this added to the past production gives in round figures 32,000,000 oz. opened up by development or about 1280 oz. of silver per foot of development.

The concentrating mill was operated 97.94% of possible time. The total tonnage of ore milled was 54,522 or an average of 2.93 tons per stamp per 24 hr. The mill heads averaged 24 oz. per ton. The sand tailings from the mill averaged 3.18 oz. per ton and the slime tailings, 6.66 oz., a general average of 4.21 oz. per ton.

The sleeping camps and dining room accommodated an average of 54 men, at a charge of 60c. per day; the actual cost to the company, however, was 75c. per day. The average disability from sickness and accidents was 32 hours per man as compared with 47 during the previous year. Seven of the company's employees enlisted and are now serving at the front in the British army.

The following data are given on the Reddington rock drill which is used by the company. The cost of repairs per drill per month: 3⅛-machine, $12.57; 2¾-machine, $11.65; 2¼-machine, $3.60. The average number of drills working for the year was: 5.75 3⅛-in. machines, eight 2¾-in. machines and one 2¼-in. machine; or an average of 14.75 drills per shift. The average footage drilled per hour was 3.18 ft., compared with 3.15 and 3.13 ft. for the previous years. These figures are based on the hours the drill was working.

Total receipts for working account amounted to $1,407,877, and working expenses, $418,261, leaving a working profit of $989,616. After payment of dividends and making other adjustments the surplus account was reduced $351,613 during the year.

Oriental Consolidated

The report of the Oriental Consolidated Mining Co., Chosen, Asia, for year ended July 31, 1914, shows net receipts over all expenditures amounting to $622,780. The total receipts were $1,731,472; operating costs, $994,733 and new construction and development work, $113,959. The mines produced 301,162 tons of ore averaging $6.85 per ton; of this, $3.44 was saved by amalgamation, $2.16 by cyanidation of concentrates, making a net yield of $5.60 per ton. The mines were estimated to contain 822,500 tons of $5.80 ore in reserve at July 1, 1914. Development work totaled 32,379 ft. for the year.

The total cost per ton was $3.68 made up of mining, $1.98; milling, 56c.; concentrate treatment, 32c.; transporting of ore, 1c.; general expenses, 43c; development of outside mines, 3c.; and construction expense, 35c. per ton. Total receipts per ton were: from ore, $5.60; store profit, 8c.; interest and other receipts, 5c.; profit from dump retreatment, 2c.; total, $5.75 per ton of ore. Dividends amounting to $644,085 were paid and quick assets after this totaled $938,116; $511,780 was in cash and $356,084 in supplies. The following table gives the result of cyaniding concentrates at the different plants:

	Tons Treated	Assay Value per Ton	Extraction Per Ton	Extraction Per Cent	Cost of Treatment per Ton
Tarcol tube mill plant.	12,856	$30.83	$24.72	80.2	$4.58*
Tarcol cyanide plant...	10,285	29.83	24.60	82.5	1.63
K.S.D. plant.....	4,552	25.04	14.80	59.1	1.87
K.S.D. dump retreatment.....	12,646	7.37	4.70	63.8	3.18
Candlestick plant.....	7,778	3.56	1.91	52.4	1.08

* Shut down on account of high cost.

The consumption of supplies in cyanide treatment of concentrates follows: cyanide, 3.885 lb. per ton; zinc and zinc dust, 11.3 lb.; borax, 0.78 lb.; lime, 20.5 lb.; cordwood, 0.135 cord per ton; soda, 0.095 lb.; kerosene, 1 gal. for 41 tons of concentrates; engine oil, 1 gal. for 47.5 tons; cylinder oil, 1 gal. for 91 tons; miscellaneous oils, 1 lb. for 24.4 tons; bar iron, 1 lb. for 20.5 tons.

In the mill, 27.3 tons of ore were treated per cord of wood consumed; 460 tons per battery shoe; 666 tons per battery die; 42.4 tons per lb. of bar iron; 28.7 tons per lb. of sheet iron; 440 tons per lb. of miscellaneous iron; 101 tons per lb. of steel; 107 tons per lb. of candles; 204 tons per gal. of kerosene; 575 tons per gal. of cylinder oil; 223 tons per gal. of engine oil; 178 tons per lb. of lubricant; 12.5 tons per oz. of quicksilver; and 68.5 tons per lb. of nails. Other mill supplies used in treating 301,162 tons of ore were: 10 battery bosses, 31 tappets, 6 cams, 7 stems, 7 camshafts, 10 crusher shoes, 14 crusher dies, and 13 concentrator belts. The items of milling cost were: supplies, 25.75c. per ton; assays, 0.896c.; shops, etc., 2.716c.; electric power, 11.16c.; salaries and board, 8.239c.; and payroll, 6.764c.; total, $5.525c. per ton.

In mining, one pound of dynamite was consumed for every 2.01 tons of ore mined; 1 lb. of candles for 1.5

tons; 1 gal. of kerosene for 460 tons; 1 gal. of cylinder oil for 170 tons; 1 gal. of engine oil for 136 tons; 1 lb. of lubricant for 48.5 tons; 1 lb. of drill steel for 6.2 tons; 1 lb. of bar iron for 9.4 tons; 1 lb. of sheet iron for 13.4 tons; 1 lb. of miscellaneous steel for 154 tons; and 1 lb. of nails for 8.8 tons of ore mined. The items of mining cost were: supplies, 92.846c. per ton; assays, 0.516c.; shops, etc., 2.881c.; salaries and board, 13.592c.; payroll, 79.397c.; electric light and power, 8.73c.; total, $1.97962 per ton mined.

Broken Hill South Silver

The following data were taken from the semi-annual report Broken Hill South Silver Mining Co., Broken Hill, Australia, and cover the six-month period ended June 30, 1914. There were 172,421 tons of ore raised averaging 15.2% lead, 6.9 oz. silver and 13.8% zinc. There were 172,330 tons treated in the concentrating plant, producing 28,745 tons of concentrates averaging 68.5% lead, 22 oz. of silver and 7.1% zinc per ton. In addition to this there were 105,779 tons of zinky tailings produced assaying 3.2% lead, 3.2 oz. silver and 16.7% zinc. Of the ore hoisted 96.1% was broken on contract and 3.6% came from development work, leaving only 0.3% broken by men on wages. Of the ore trammed to shaft 99.7% was handled by contractors. There were

	Concentrates	Tailings Zinc	Tailings Quartz	Tailings Slimes	Total
Net weight, tons	28,745	105,779	10,439	27,367	172,330
Proportion to whole	16.7	61.4	6.1	15.8	100
Assay value:					
Pb, per cent	65.8	3.2	1.5	10.6	15.2
Ag, oz	22	3.2	1.9	7	6.9
Zn, per cent	7.1	16.7	4.5	13.1	13.8
Metal contents:					
Tons lead	19,679	3,393	153	2,903	26,128
Ounces silver	632,010	342,864	19,573	192,279	1,186,726
Tons zinc	2,034	17,634	471	3,589	23,728
Proportion of metal contents:					
Per cent. lead	75.4	13.0	0.6	11.0	100
Per cent. silver	53.3	28.9	1.6	16.2	100
Per cent. zinc	8.6	74.2	2.0	15.2	100

41,836 cu.yd. of filling placed in the mine at an average cost of about 92c. per cu.yd. or 21.6c. per ton of ore produced. Underground employees numbered 987 but only 806 were in daily attendance, the average daily tonnage per man underground, indicated from figures given, was about 1.37 tons. During this time 9500 ft. of development work was accomplished. The average earnings of contractors mining was $4.45 and of trammers, $3.50 per shift. Water consumption was about 201 gal. per ton of ore treated. The working cost as reported was $5.20 per ton made up of $3.13 for mining, 22c. for filling, 83c. for development, and $1.02 for concentration.

The above tabulation shows the classification effected by the treatment plant during the year.

Tomboy Gold Mines

The report of the Tomboy Gold Mines Co., Telluride, Colo., for year ended June 30, 1914, shows a profit of $409,541 on operations and a net balance of $343,974 after deducting London expenses, depreciation, and income tax. Of this balance, $301,320 was paid in dividends. The profit on the ore, excluding depreciation and other receipts, London expense, income tax, etc., was $354,682 from 137,456 tons yielding $6.98 per ton. The operating cost was $4.40 per ton made up of mining, $1.71; development, 79c.; milling, 54c.; concentrating, including transporting ore to railroad, 73c.; water-supply, 13c.; assay office, 4c.; general expenses, 24c.; taxes and insurance, 22c. per ton. Adding depreciation and other expenses deducted by the London office the total cost was about $4.48 per ton.

It is stated that experiments have demonstrated the amenability of the Tomboy ores to treatment by cyanidation and that a plant is being erected to have a capacity to treat 400 tons of tailings a day.

Liberty Bell

The figures given herewith were taken from the annual report of the Liberty Bell Gold Mining Co., Telluride, Colo., for year ended Sept. 30, 1913.

RECEIPTS PER TON OF ORE MILLED	1913	1912	1899-1913
Stamp bullion	$2.25	$3.22	$3.87
Cyanide products	2.18	2.77	2.24
Concentrates	.56	.88	.82
Concentrates cyanide bullion	.25	...	.03
Slag	...	...	.01
Total ore proceeds	$5.24	$6.87	$6.97
Miscellaneous profits	.20	.22	.17
Total proceeds	$5.44	$7.09	$7.14
EXPENSES PER TON ORE			
General (per ton milled)	$0.50	$0.61	$0.72
Mining (per ton mined):			
Operating	1.43	1.68	2.39
Development work	.26	.17	0.07
Tramming	.16	.16	.29
Milling	1.41	1.47	1.63
Treatment and shipment costs	.19	.28	.22
Average cost on basis of tons milled	$3.95	$4.37	$5.32
Profit per ton milled	$1.49	$2.72	$1.82

During 1913, details of shipment and treatment costs were as follows: On stamp bullion, 3c. per oz. of gold; on concentrates, $15.10 per ton of concentrates; on cyanide bullion, 2c. per oz.; and on cyanide bullion from concentrate treatment, 3c. per oz. of bullion. In mining 179,178 tons of ore, 355 boxes of candles were consumed and 310 tons of coal used for heating. Some of the principal supplies consumed in milling follow: Quicksilver, 0.125 oz. per ton of ore; 0.985 lb. of cyanide; 0.526 lb. of zinc; 8.1 lb. of lime; and 0.312 lb. of lead acetate and litharge per ton of ore milled.

In mining 179,178 tons and running 5662 ft. of development work 148,200 lb. of powder was used. It is stated that the amount of powder consumed was due in part to the amount of drifting done and in part to the method of doing it. A bonus system of payment substituted for the older contract system led to an unusual consumption of explosives but it was made up in the saving of labor. The net results, however, were not good and the contract system was resumed. The width of the vein in the area mined was 5.4 ft. against 4.6 ft. for the previous year. The average width of the vein to date including pinched portions is three feet. The Liberty Bell has produced 1,397,168 tons of ore to date and performed 59,799 ft. of development work or about one foot for every 23.4 tons of ore produced. Including ore in sight the ratio is 35 tons per foot of development. Counting all possible ore within the property above the Stilwell tunnel, development work equals about one foot for 50 tons of ore. The total ore proceeds to date amount to $9,727,012, and expenses, after deducting miscellaneous receipts, $7,217,296. Profit balances amount to $2,509,716, but of this amount $360,486 for construction still stands on the books to be charged out. The total expenditure to date for construction is $712,042, or about 51c. per ton of ore produced. The ratio of concentration is 65:1 and has averaged 64:1 to date.

New Street Quotations

The *Wall Street Journal* says:

Dow, Jones & Co. and the "Wall Street Journal" have been many times requested to publish quotations made in New St. during the suspension of the Stock Exchange in order that financial people might have a complete record.

It is true that these quotations in part represented actual transfer of securities where cash was paid over for stocks; but to recognize the existence of this market, even at the present time, is to establish a dangerous precedent.

Moratoria prevailed in the latter part of 1914 over the civilized world, which meant that the stress of war was such that everybody must be called upon for a time to stand still, and buy and sell only for food and drink, and what was absolutely necessary to human existence.

The Stock Exchange and the bankers of Wall Street gripped the situation with a firm hand, and declared that the quotations that prevailed July 30, on the closing of the exchange, should stand as the quotations for all financial transactions and valuation of assets.

The quotations that were made in New St. were no more legitimate quotations than the quotations that were made in Belgium, where people with securities in their pockets, and fleeing from war and starvation, sold them for cash at 30% and 40% discount to some itinerant peddler who could cross the channel and realize the full quotation in London. Neither in Belgium nor in New St. was there a free, fair or open market. Not one of the 1100 members of the New York Stock Exchange could execute an order in New St. or even advise, personally, by circular or by telegram, the purchase of a share of stock.

Dow, Jones & Co. in its news services and in the "Wall Street Journal" took cognizance of these New St. quotations made right under their windows as incidents of some slight general news worth, but as in no way constituting a legitimate or quotable market.

In the interest of public safety, and as a defensive war measure for the protection of the general credit, and for no other reason, would the "Wall Street Journal" refuse to give its subscribers the full details of everything transpiring at the circumference as well as the center of finance.

To publish now or in any way to recognize these quotations, except on the same basis as quotations that might be made in Hoboken or Belgium, is to permit unwarranted attack upon a large volume of transactions and settlements that were passed by the committee of the New York Stock Exchange during the suspension of the market, and also to impugn the collateral loans of the banks, and the integrity of both sides associated with bank loans.

It is all right as a matter of human interest to declare that if a man were in Belgium or Germany at certain critical points and times, with the gold in his pocket, he might have bought securities at half the value recognized elsewhere in the world. But neither such incidents nor the New St. "curb" or "gutter" markets constitute a basis of true comparisons in respect to financial values.

The New York stock market closed July 30 on the inauguration of war, and for many weeks finance rested in the night of the war cloud. The strong position of American finance today is due to the fact of that resting. The men of the Stock Exchange and of banking finance in New York are entitled to the greatest credit for their patriotic and successful labors during that period.

Of course, everybody suffered—newspapers and news publications; but any other course would have been toward bankruptcy and chaos. Neither the public nor the press can go forward in a bankrupt world. The less prominence given to quotations of sales representative of individual distress or disaster, and where there was no free market, the better.

New Keystone-Inspiration

The proposed sale of the property of the New Keystone Copper Co. to the Inspiration developed a very pretty fight, which is not yet ended. The management of the company issued a call for proxies for a meeting on Jan. 6, but the meeting was enjoined by certain minority interests, led by Carl F. Pforzheimer and F. E. Huntress. The latter issued a circular to stockholders, the management issued another, and both parties engaged in a contest for proxies, a vote of two-thirds of all the stock being necessary to authorize the sale of the property. The total number of shares issued is about 360,000.

At an adjourned meeting, Jan. 15, the management turned up with 255,000 shares and the opposition with 50,000. James S. Dunstan, one of the directors of the company, represented interests holding 17,000 shares, which he voted with the management, giving the latter the necessary three-fourths. The opposition, however, questioned the validity of certain proxies and the contest is not yet settled.

The dispute is over the terms of the sale. The majority interests in the company think a good trade is being made, while the minority is not sure about it.

The Cottrell Dinner

A dinner in honor of Dr. Frederick G. Cottrell was given under the auspices of the American Institute of Mining Engineers, American Electrochemical Society, and Mining and Metallurgical Society of America at the Hotel Plaza, New York, Jan. 15. About 120, including many ladies, were present. This dinner was given to express the high esteem in which Doctor Cottrell is held among his technical brethren, both for his scientific attainments, especially in developing the Cottrell process, and for his munificence in bestowing that process upon the Research Corporation for the enrichment of scientific research.

DR. F. G. COTTRELL

The matter is concisely set forth in a minute adopted by the Research Corporation in recognition of the services rendered by Frederick G. Cottrell, B.S., Ph.D., to the advancement of science. This minute was adopted at the annual meeting of the Research Corporation, Jan. 15, and was as follows:

In 1911 Frederick G. Cottrell, B.S., Ph.D., offered to transfer to the Smithsonian Institution substantially all his rights in his inventions and patents covering the processes known as the electrical precipitation of suspended particles in order that the profits resulting from the application of the patents, already well assured, might be applied to the advancement of scientific research and investigation. Naturally this proposition was at once recognized as both generous in spirit and highly original in conception. It was Dr. Cottrell's ideal to render discovery already made the mother of new discovery, and thus contribute to the scientific and technical development of the industrial arts.

This far sighted and patriotic conception found its realiza-

tion through the "Research Corporation," which for administrative reasons was substituted for the Smithsonian Institution as the custodian of Dr. Cottrell's endowment. The objects of the Research Corporation as stated in its charter are:

To provide means for the advancement and extension of technical and scientific investigation, research and experimentation by contributing the net earnings of the corporation, over and above such sum or sums as may be reserved or retained and held as an endowment fund or working capital, to the Smithsonian Institution, and such other scientific and educational institutions and societies as the board of directors may from time to time select in order to enable such institutions and societies to conduct such investigations, research and experimentation.

Organized in 1912 as a stock corporation, but precluded by its charter from paying dividends and capitalized by a group of gentlemen desirous of furthering Dr. Cottrell's objects, without personal profit, the Research Corporation undertook and successfully accomplished the installation of the Cottrell processes in various industries throughout the country, with the result that in two years' operation its surplus has provided the capital of $20,000 required by its charter, and a fund of over $100,000 for scientific research.

The accomplishment of this remarkable result, which both justifies Dr. Cottrell's expectations and realizes his hopes, is due to his generosity and foresight, and the directors of the Research Corporation take this occasion to express to Dr. Cottrell their appreciation of his contribution to scientific achievement and to the advancement of science, and tender him their cordial congratulations and sincere thanks for the public service which he has rendered.

At the dinner, Sidney J. Jennings presided. The speakers were: Dr. Charles D. Walcott, director of the Smithsonian Institution, representing the Research Corporation; William L. Saunders, representing the American Institute of Mining Engineers; F. A. Lidbury, representing the American Electrochemical Society; Walter Renton Ingalls, representing the Mining and Metallurgical Society of America; and Doctor Cottrell.

In his remarks Doctor Cottrell laid special emphasis on the assistance he had been given by his several associates, and insisted that he must only be considered a co-donor with them, in giving his patents to the Research Corporation. Excerpts from his remarks follow:

The earliest coöperation and assistance received in the work was from Dr. Harry East Miller, a consulting chemist of San Francisco, who became actively interested in the problem of acid- and smelter-fume control even before any serious consideration had been given to the use of electrical methods and while the work still centered around centrifugal separators. He was the first man directly engaged in industrial work who sufficiently appreciated the possibilities foreshadowed and had the courage to spend real money, and particularly his own money, for their development.

The experiments already commenced on a very small scale in the laboratories of the University of California, at Berkeley, were transferred and continued in Doctor Miller's private laboratory in the old Stock Exchange Building, in San Francisco, until the earthquake and fire of 1906 made a clean sweep of the entire equipment.

The business difficulties and responsibilities of the work commenced to develop in earnest almost in direct proportion to the degree of technical success met with, and the necessity became apparent for effecting a commercial organization strong and stable enough to adequately handle negotiations with the corporations being dealt with.

At this stage of the development, Doctor Cottrell and Doctor Miller were joined in the undertaking by E. S. Heller, a lawyer and business man closely associated with some of the strongest financial interests of San Francisco and the West generally. He and Doctor Miller had been classmates and chums in the College of Chemistry of the University of California back in the early '80s before Mr. Heller decided for the law and business. He had taken from the first a friendly interest in the work and had drawn for them such papers as had been necessary, but now he came forward with substantial financial assistance and what was even more important took personal direction of the larger and more important legal and business phases of the venture.

Prof. Edmond O'Neill, Dean of the College of Chemistry at the University of California, who had been teacher and inspiration to all three of these friends and coworkers, formed the fourth member of the little group who, under the name of the Western and International Precipitation Co., owned and developed, for the next five years, the patents which were, at the end of that time,

E. S. HELLER F. G. COTTRELL
E. O'NEILL H. E. MILLER

given jointly by these four associates to the Smithsonian Institution, and by it later turned over for administrative purposes to the Research Corporation, which had in the meantime been organized for the purpose under the direction of the Smithsonian.

The Engineering Foundation

The Engineering Foundation, inaugurated by the United Engineering Society, is the name given to a fund to be "devoted to the advancement of the engineering arts and sciences in all their branches, to the greatest good of the engineering profession and to the benefit of mankind."

The administration of this fund will be entrusted to the Engineering Foundation Board, elected by the trustees of the United Engineering Society and composed of 11 members, nine from the American Society of Civil Engineers, the American Society of Mechanical Engi-

neers, the American Institute of Mining Engineers, and the American Institute of Electrical Engineers, and two chosen at large.

The initial gift for the Engineering Foundation is from a noted engineer whose name will be announced at the inauguration ceremonies, Wednesday, Jan. 27, 1915, at 8·30 p.m., in the auditorium of the Engineering Societies Building, 29 West 39th St., New York City.

The speakers at this inauguration meeting will be: Gano Dunn, president of the United Engineering Society and past-president of the American Institute of Electrical Engineers; Dr. Henry S. Pritchett, president of the Foundation for the Advancement of Teaching; Dr. Robert W. Hunt, past-president of the A. I. M. E.; Dr. Alexander C. Humphreys, past-president of the American Society of Mechanical Engineers.

The Marquette Range Sixty Years Ago

To those who think of the several ranges in Michigan and Minnesota, which constitute the "Iron Country," as being about the most accessible and highly developed region in which the metal miner is likely to have a chance to work, a glimpse of conditions as they were in the '50s when operations were just beginning, is most instructive. The New York *Evening Post* of Sept. 8, 1853, published an account by Robert Kelly, father of William Kelly, now manager of the Penn Iron Mining Co. on the Menominee, describing a water journey from Detroit to Marquette and the Marquette range. The account was read before the meeting of the Lake Superior Mining Institute last summer and is reprinted in *Iron Ore*.

Mr. Kelly visited the Soo and his remarks anent the terms on which the canal was built are uncannily prophetic. He writes:

The Saut Sainte Marie Canal Co. was incorporated by the legislature of the State of Michigan at the last session. They advance all the capital that may be necessary, and when the work is completed, according to specifications, they will become the owners of half a million acres of the public lands, appropriated by Congress to the State of Michigan for the construction of the canal. The idea was, perhaps, that the work would be constructed with the property of the government, but the question of constitutionality would be avoided as a direct issue. The State of Michigan has transferred the task, and her rights to the lands, to the company she has incorporated. They have, it is understood, the privilege of indicating in advance the sections which they wish to secure and have actually, as the first step, marked every unentered section of land in the upper peninsula of Michigan, good, bad, and indifferent, amounting to something less than two hundred thousand acres.

All the mineral treasures that may be discovered hereafter in this territory, will be theirs. The general expectation is that a large profit will be realized by the company, and they will have earned it fairly. But is not this a portentous monopoly of lands and mines? **The vast gifts of lands to private corporations that have been made within a few years past, will, at no distant day, excite the astonishment of the nation.**

As for Marquette in those days:

Marquette is the port of an important and extensive iron district, lying south from it at a distance of from 12 to 25 miles. This region is as yet almost inaccessible, except in winter, from the want of proper roads. But within a year from this time, probably, a plank road or a railroad will establish an easy and constant communication, bringing the mountain to Marquette and Marquette to the mountain. There is a blast furnace located there for the manufacture of blooms, erected originally by the Marquette company, but now owned and kept in operation by the Cleveland company, their successors. The ore is made into blooms without the intermediate process of running into pigs, and yields the same quantity of blooms per ton as pig iron.

From Marquette Mr. Kelly and his party proceeded over a somewhat arduous route to the Marquette iron range:

The main object of our party in landing at this point, was to visit the iron district. . . . The resources of the place were put in requisition to equip the expedition, and furnish supplies for several days. Two or three saddle horses were obtained and two wagons for the conveyance of bedding, stores and baggage, and the transportation of those who felt disposed to undergo the dislocating process of the wheel torture. The major part performed the journey afoot, over a road terribly rough in its best state, and now full of sloughs, by reason of long-continued rains. We established our quarters at Jackson Forge, on the falls of the Carp River, a distance of 10 miles from Marquette, converting a small unoccupied and unfurnished house into a hotel . . . . The neighboring Carp furnished us with trout, a spring some rods distant supplied us with water, and a store of wood was at hand to furnish smoke-fires as our night watches against countless hordes of pestiferous mosquitoes and flies. . . . We made an early start, and, after a walk of four or five miles over a road similar to that which had tried our patience and our boots the previous day, reached Jackson Iron Mountain. . . . We spent several hours in the exploration of Jackson Mountain. The whole smithy of Vulcan with all his Cyclopean helpers, could never have heaped up and would never exhaust this vast pile of mineral that has been thrown out from Nature's deepest laboratory. The only idea that can be given of it is, that it is a hill of iron-stone, broken into fragments or cracked in seams, three-quarters of a mile long, half a mile wide, and rising to a height of 150 feet.

It would be an interesting proposition for such as choose to undertake it, to calculate from these data the quantity of iron contained in the mass above the surface. One side of the hill is nearly precipitous, showing the iron from top to bottom. The most of it is covered with trees which have found their nourishment in the thin deposit of earthy substances and decayed vegetable matter that in the lapse of centuries has been formed over the mineral upheaval. In several places we tore away with our hands a matted bed of mosses and leaves, and picked up from beneath fragments of ore with no mark of rust upon them. There are differences in the appearance of specimens obtained from various parts of the moss, but the results of analyses and of working the ore, show that it is singularly uniform throughout in quality and purity. All the ore that has been used at the Jackson Forge and at the Marquette Forge, was obtained from a single small spot, and from it has been manufactured all the iron known as Lake Superior iron, already celebrated for its remarkable toughness and valuable properties for shafts and axles. It is quarried at very small expense, blasting easily, and breaking up at each blast into convenient fragments, differing in this respect from the mountain masses of Missouri, which are quarried with great difficulty.

An interesting picture this, of the infancy of Michigan's most famous range.

Average Metal Prices

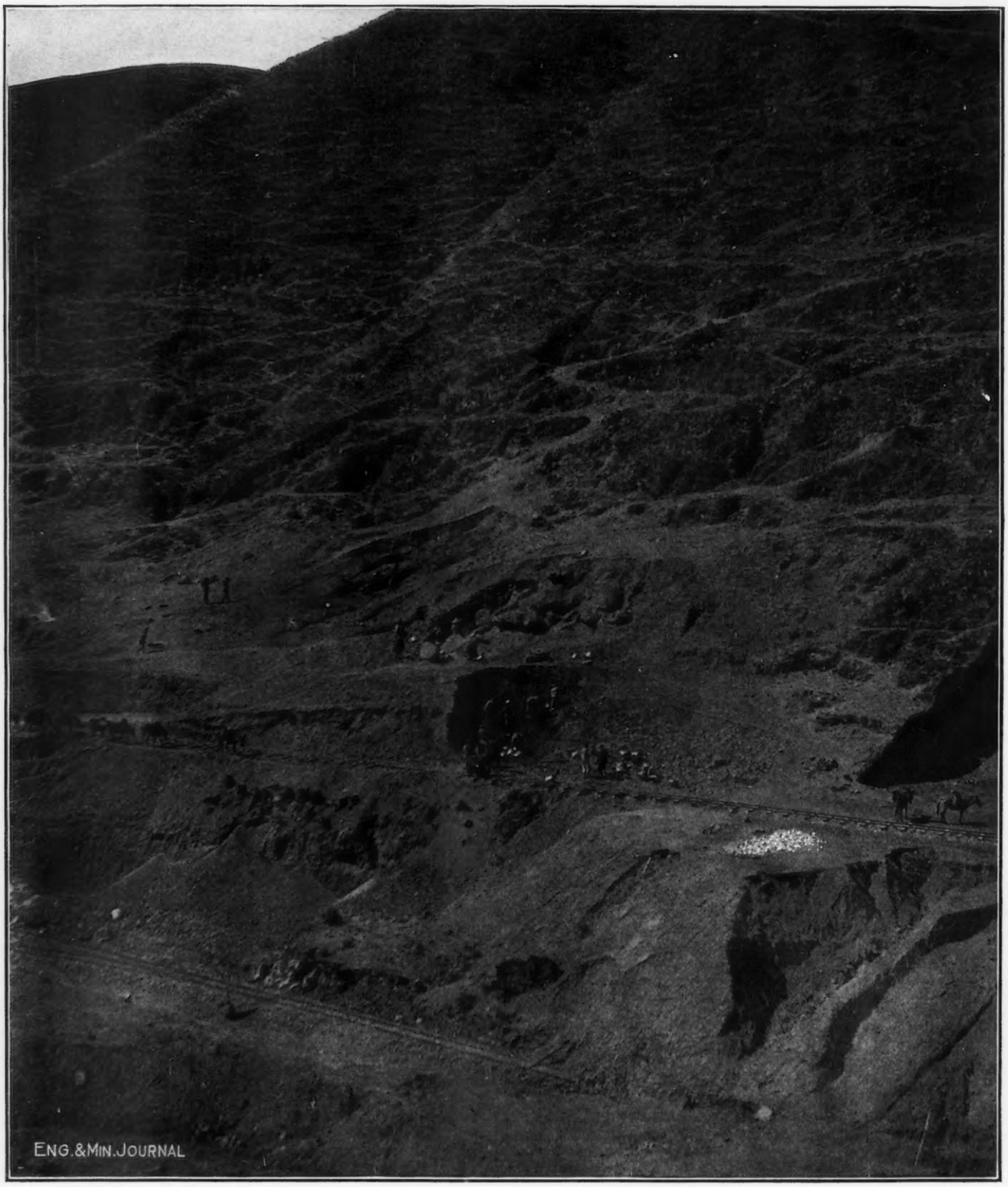
The accompanying table gives in a convenient form the average prices of the principal metals during the last 20 years.

	Copper		Lead		Tin		Spelter		
Year	Lake	Electrolytic	New York	London	New York	(a) London	New York	St. Louis	London
1895	10.76	.....	3.23	.....	14.05	63.333	3.63	.....	.....
1896	10.88	.....	2.98	.....	13.29	59.496	3.94	.....	.....
1897	11.29	.....	3.58	12.367	13.67	61.400	4.12	.....	.....
1898	12.03	.....	3.78	12.983	15.70	71.204	4.57	.....	.....
1899	17.61	16.67	4.47	14.933	25.12	122.429	5.75	.....	.....
1900	16.52	16.19	4.37	16.987	29.90	133.575	4.39	.....	.....
1901	16.55	16.11	4.33	12.521	26.74	118.633	4.07	.....	.....
1902	11.887	11.626	4.069	11.262	26.79	120.720	4.84	.....	.....
1903	13.417	13.235	4.237	11.579	28.09	127.320	5.40	5.191	.....
1904	12.990	12.823	4.309	11.983	27.99	126.733	5.100	4.931	.....
1905	15.699	15.590	4.707	13.719	31.358	143.083	5.882	5.730	25.433
1906	19.616	19.278	5.657	17.370	39.819	180.646	6.198	6.048	27.020
1907	20.661	20.004	5.325	19.034	38.166	172.638	5.962	5.812	23.771
1908	13.424	13.208	4.200	13.439	29.465	133.124	4.726	4.578	20.163
1909	13.335	12.982	4.273	13.042	29.725	134.774	5.503	5.352	22.185
1910	13.039	12.738	4.446	12.920	34.123	155.308	5.520	5.370	23.050
1911	12.634	12.376	4.420	13.970	42.281	192.353	5.758	5.608	25.281
1912	16.560	16.341	4.471	17.929	46.096	209.420	6.943	6.799	26.421
1913	15.686	15.269	4.370	18.743	44.252	201.679	5.648	5.504	22.746
1914	.....	.....	3.862	.....	34.301	156.564	5.213	5.061	22.544

(a) From statistical report of Metallgesellschaft, Frankfurt am Main.

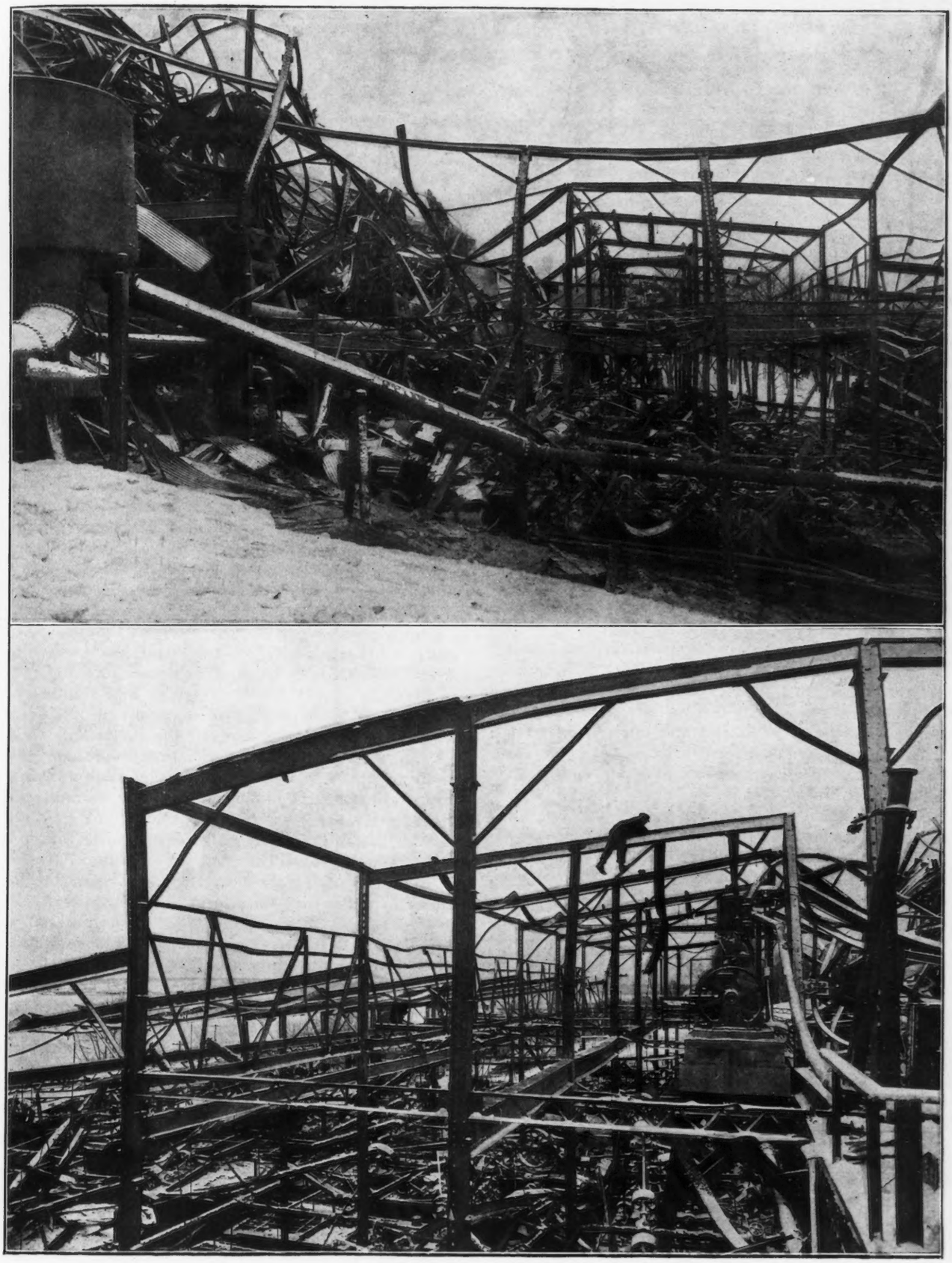
New York and St. Louis, cents per pound. London, pounds sterling per long ton.

Photographs from the Field



OLD SLAG DUMPS AT THE BAWDWIN MINES, NORTHERN BURMA

The Bawdwin mines were long worked by the Chinese for silver; the ancient slag dumps were resmelted in a modern lead blast furnace first erected at Mandalay, but later removed to Namtu, 13 miles from the mines. Development of the last two years has indicated large bodies of complex sulphide ores remarkable for their lead-silver-zinc content. Copper-silver ore is also found, along later fault planes, in the Shan lode.



THE WRECK OF THE ISLE ROYALE MILL

This mill was recently destroyed by fire. In the upper view the stamp heads and jigs are shown, while in the lower one the concentrator tables may be seen. Photographs supplied by courtesy of J. T. Reeder.

The State of the Mining Industry in Germany

SPECIAL CORRESPONDENCE*

We still have to post our letters unsealed, but incoming mail arrives sealed without any trouble. Printed matter has always come through regularly, only about 12 days later than at normal times. I have not lost a single copy of the JOURNAL yet, though sometimes there will be a number lagging behind. However, it is sure to turn up sooner or later.

As no statistics about the state of industrial enterprises during 1914 are available yet, I can give but a few vague notes. According to my information there is no lack of raw material for at least a year to come except in the case of nickel, mercury, petroleum and perhaps tin. The production of metals, though fostered by the military authorities, is hampered by the lack of men. For a time the impossibility of getting transportation on account of the movement of troops and war material and for want of cars was also a serious disturbing factor, but this has been overcome largely by the running of freight and passenger trains on a regular schedule time and by the acquisition of cars captured in the hostile countries.

From an official publication I gather that the decrease of males employed in November, 1914, amounted to 25%, as against the same month in 1913. From Kattowitz, Upper Silesia, a newspaper correspondent wires the startling news that round about that town all blast-furnaces are running and all the cages in the shafts are whirring up and down, most of the work being performed by women and girls. This may be exaggerated; still, one fine day we had about 4000 young men from Upper Silesia quartered upon us, an equal number being sent to Lower Silesia when there was a possibility that the Russians might break through the lines of the allied Germans and Austro-Hungarians into that industrial district. After a lapse of four weeks, when all danger had passed, the exiles were shipped back to their homes.

For the present scope of operations, being two-thirds of normal, the iron-ore supply is sufficient. Of it, 57% comes from local mines, 8% from Austria-Hungary, 15% from Sweden and 20% from Siegerland. If the Swedish supply should fail, there are other sources to draw on. Scrap is abundant. No ore has been imported from Russia since 1912. The monthly output of pig iron with 24 furnaces running at present amounts to 62,000 tons.

The extraction of ore from the minette country about Briey, Lorraine, has been kept up at a small scale by the German owners and the water pumped out to prevent the flooding of the mines. Some of the large iron works and rolling mills have started, or are about to start up, part of their plants, to save them from destruction. The German administration in Belgium is running the Cockerill works at Seraing, presumably on repair work for the army. None of the zinc works has been damaged by the ravages of war, but none are running, inasmuch as they lack both ore and men.

The German government has urged the public to make more extensive use of coke in household and industry in order to stimulate the production of gas; and, what is more important, of benzol, which is used extensively by the motor cars in the field, instead of benzine, which is procurable in limited quantities only. The scarcity of petroleum is distressing to the poorer classes, who cannot afford to pay for an expensive installation of gas or electric light in their homes. Before the advent of mineral oils rape oil was the current article for lamp lighting. But since its abolition for that purpose, its consumption has become limited and rape is not cultivated to the former extent. Hence there is also a scarcity of that article.

The question of employing prisoners of war to do work for the public good has been often mooted, but dropped when it was found that tuberculosis was a prevalent disease amongst the French soldiers, and the Russians are suspected of harboring occult cholera bacilli.

It may be interesting to many pupils of Prof. Carl Schnabel to learn of his death at Berlin, Prussia, in the 71st year of his age.

*Dated Dec. 29, received Jan. 19.

El Cobre Mine Unwatered in 1914

The long fight against water in El Cobre mine, near Santiago de Cuba, has been won at last by Manager Edward H. Emerson, who succeeded in accomplishing the final unwatering of this copper mine in May, 1914. His difficulties were aggravated by the fact that the *antiguos,* before abandoning the mine, had done a large amount of underhand stoping. These stopes filled with water, forming underground lakes, of unknown extent and impossible to locate, constituting a constant menace. The entire force was driven out of the mine on one occasion when unexpectedly a large body of water was encountered. Fortunately, provision had been made for taking care of such happenings, and no serious accidents occurred.

In addition to the water menace, mud and débris had accumulated in the bottom of all the shafts and workings, and when tapped, it flowed into the workings; this greatly retarded the work of unwatering as it was most difficult to handle. Pumping was done with compressed air wherever possible.

As far as can be ascertained, this mine has been under water since 1861. The questions to be decided were: (1) Had the mine been abandoned—as claimed by a number of authorities—on account of difficulties resulting from depth and heavy water, the mine being 1100 ft. deep? (2) Was it abandoned because of a revolution which occurred sometime about the beginning of our Civil War? (3) Had the mine been abandoned because the ore had decreased in grade as well as in quantity?

The results of Mr. Emerson's latest exploration seem to show that the abandonment of this historic mine was due to one of the first two reasons mentioned above. His development showed that the unoxidized chalcopyrite ore occurs in substantial widths, and shipments of ore from the lowest level demonstrated a value of at least 8% copper in this ore. In addition, there were found substantial bodies of lower-grade ore, which is particularly amenable to the Minerals Separation process, with which it is now being handled. These results promise a revival of the Cobre mines, under a reasonable price for copper. It has been seven years since the first effort was made to reach the bottom of this famous old mine, and its final accomplishment is a matter of congratulation for the management and for the stockholders.

Correspondence and Discussion

Packing of Machinery, Etc., for Shipment Abroad

The following notes are compiled from the point of view of the one who has to receive, check and assemble goods at their destination. In each case wherever an error or source of trouble is indicated, such error has been found to occur many times and these remarks cover a large and varied number of shipments:

(1) All shipping marks, case numbers, etc., should be on at least two sides of each case or package, and where there will be much handling or trans-shipment before the end of the journey, it is advisable in addition to the usual stencil work to have the marks, etc., on stamped-metal plates, as after a long journey some or all of the stencil work often cannot be deciphered.

(2) Small details, such as keys, collars, etc., should not be in same cases as heavy pieces such as shafting; often the case arrives broken, and the details, being small, are lost.

(3) Instructions on packages and cases, such as "Do not stow near boilers," should be written in the language or languages which apply to the steamships or means of transport in question—the English language only is not necessarily sufficient.

(4) Steel plates, angle irons, etc., and generally material for steel tanks, buildings, etc., should not only have the erection marks boldly painted on, but these marks should also be stamped on after the plate has been painted, and at a spot clearly indicated, as by a paint mark—often these stamped marks are entirely buried by the last coat of protective paint which is put on before shipment.

(5) The corners of steel plates for tanks, especially those that are "drawn out," should be protected, otherwise they are likely to get badly bent in handling, especially when the plates are in heavy bundles.

(6) Rivets, bolts, etc., in drums with lids only roughly clipped on, often arrive open and are subject to much loss—in general, these drums are altogether too weak for much handling.

(7) Fragiles, such as some assay goods, should always be in cases with some sort of handles, conveniently of rope, to facilitate careful handling.

(8) Crucibles for assaying and smelting work are very often in casks too weak for the purpose.

(9) Chemicals, at least those from England, which are packed in corked wide-mouth bottles, have useless corks on them; the corks should be about half their depth in the neck of the bottle and the other half sticking out, so that after once opening the bottle, the cork can be replaced practically air-tight again. Usually an absurdly thin cork is used and this is countersunk, and the air-tight joint is made by the packers by dipping the neck of the corked bottle in paraffin wax. After the bottle is once opened, the cork, being too thin, is no use for properly closing it again. In this way, especially in out of the way places, any chemicals which spoil by exposure to air, moisture, etc., have every chance of doing so. Again, it is quite usual practice to pack deliquescent chemicals in paper or in other parcels which are anything but air-tight and this when the goods are going to wet countries like West Africa.

(10) Heavy chemicals are often in tins or casks without anything to show the nature of the contents—the man at the receiving end has plenty to do without having to test to find out what the contents of a cask are.

(11) Some manufacturers do not yet appear to have learned that lead acetate cannot safely be shipped in zinc-lined cases; the same remark also applies to cyanide, more especially when the place of its destination is a wet country.

(12) Cards and pamphlets of working instructions, such as are often sent by makers with machines, should be mailed, or at least packed separately; such working instructions being often packed in with heavy machinery get lost or damaged when unpacking.

H. T. DURANT.

London, England, Dec. 16, 1914.

May the Institute Indorse Opinions?

In the *Mining Press* of Jan. 2, the editor says that under the present constitution of the A. I. M. E. "in even so innocent a matter as joining the other national technical societies in issuing a common style sheet, it has been held that the Institute could not bind itself." Since the use of a style sheet is distinctly a part of the work of "publication," the adoption of such a regulation is explicitly authorized by the constitution, and, so far as I know, nobody has ever "held" otherwise.

In the same journal, Edmund B. Kirby, writing on the same subject, says: "In short, when the Institute wants to do anything, it should be free to do it." Of course, he proceeds to explain, the thing must be suitable—not the tariff, or the European war, or religion or socialism. Common sense, he thinks, will take care of that. Among the "suitable" things, according to the editorial quoted, is the amendment of the Federal mineral-land laws. Mr. Kirby entitles his article, "Shall the Institute Express Opinions?" There is but one answer to that: the Institute was organized for that purpose, and has been expressing opinions, with or without facts, for 44 years. The new proposition is that the Institute shall stop mere talking, and do something. It should not merely express opinions, but decide upon them, determining by a majority of the directors, or of members voting, which opinion should be officially expressed and which officially condemned. The proposed amendments would permit the directors to commit their own board without consulting the members at all, while the Institute could be committed formally, perhaps, only by a postal referendum.

Now let us see how this would work in the case of the movement to amend the Federal mineral-land laws. Those laws affect a few states and territories only. An over-

whelming majority of the members of the Institute—geologists, chemists, engineers, electricians, etc., residing and operating in the Eastern States, Texas, Canada, and Mexico, do not come into contact with them, do not understand them, and can form opinions concerning them only upon the arguments advanced by others. In other words, this majority is not a body of expert judges. It is simply an audience of intelligent listeners to be persuaded.

But in the small minority of members who do understand this subject, realize its importance, and desire to promote a much-needed reform, there is a decided difference of opinion. On the one question concerning which any considerable and unanimous party is in evidence, namely, the abolition of the extra-lateral right, some members, admitting the existence of grave evils, do not think the abolition of the extra-lateral right would cure them, and recommend different remedies. Others think that the extra-lateral right was a bad thing, and has done much harm, but that its abolition at this time, after more than 40 years of practical operation, and judicial construction, and the establishment of innumerable vested rights under it, would be unwise. Others, again, while willing to express their unfavorable opinions of the "apex law" in a free discussion, are not willing to be active in a political movement which they fancy is premature, and believe to be, in their own districts, unpopular. And, finally, there is the party to which I belong, and which advocates the abolition of the apex-rights, whatever incidental inconvenience may result. I think it probable, though I am not perfectly sure, that a vote of those members of the Institute who are qualified to judge would result in the victory of my party. But I would certainly not wish to put such a question to a general vote of members, and have it decided by a non-qualified and uninterested and unrepresentative majority.

The moment we go beyond this one issue, and consider the other "suitable" amendments to the mineral-land law, we are lost in a chaos of conflicting proposals. The contributions on this subject to the discussions of the Institute and of the Mining and Metallurgical Society are pathetically amusing. Mr. Kirby thinks that common sense may be relied upon to keep "socialism" out; but some of the amendments proposed to the mineral-land law rest upon clearly socialistic grounds. And one of the most distinguished members of both societies declares (with implied approval) that the coming reform will include the permanent ownership by the Federal government of all the "public" mineral resources and their perpetual administration under a system of leasing! The entrance of the Institute into such a field would be preposterous.

But, recurring to the notion of "suitable" subjects, I wish to say that so far as I can see the limit to be set by "common sense," as Mr. Kirby expects, must logically apply also to the acceptance of papers for publication. If a contribution is regarded as pertinent and valuable, why should it not be officially approved or disapproved by the Institute? There is, so far as I can see, but one escape. The directors may regard it as not sufficiently important. In other words, it is not connected with any "burning question" of the day, or movement for reform—in short, with some sort of politics, Federal or state, American, of course; nobody has yet proposed the adoption of "official" opinions about Mexican or Canadian affairs. Yet, after all, why not? Are not Mexican and Canadian reformers entitled, as members of the Institute, to have their patriotic schemes of mineral-land legislation approved or condemned by an American majority of their fellow members? If not, why are they permitted to vote on American reforms?

R. W. RAYMOND.

New York, Jan. 11, 1915.

Fettling Reverberatories

Referring to H. L. Charles' letter under "Correspondence and Discussion," in the JOURNAL of Oct. 31:

The first fettling through the roof of a reverberatory furnace of large size, of which I have knowledge, was planned and put in operation by the late Charles F. Shelby and William Gmahling, in the winter of 1906, at Cananea, Sonora, Mexico. The arch was old and would soon need repairs. Mr. Gmahling thrust holes through the arch with a crowbar along the side walls and the bridge and experiments were tried on fettling the furnace through these holes. The device proved so successful that when the furnace was closed down in December, 1906, and given a general overhauling, fettling holes were made in the arch at about 2½-ft. intervals along both walls and over the bridge, and when the furnace was started up immediately thereafter, and prior to March, 1907, the method of fettling was proved to be a success, and has been followed ever since. The fettling material was marginal material from the start. At Cananea we still have men working who assisted in installing and fettling through these ports in the arch, and I believe that Harry Charles, who was employed at the Cananea smelting plant at the time these experiments were made, can confirm these facts.

L. D. RICKETTS.

Warren, Ariz., Nov. 13, 1914.

Mond Nickel Co.'s Bond Issue

In a recent issue of the JOURNAL, the statement regarding the success of the recent bond issue of the Mond Nickel Co. referred to its former bond issue as amounting to 10 times what it actually was. The actual amount of the first debenture bonds was £375,000, not £3,750,000 as stated. The total amount of the two bond issues is, therefore, £875,000, or a trifle over one-fifth of the amount which was given out by the press.

All the press notices had the same error, so the mistake was probably in the original cable.

THE MOND NICKEL CO., LTD.,
C. V. CORLISS, Manager.

Coniston, Ont., Jan. 5, 1915.

Sand Filling of Copper Mines

Noticing an article regarding the above subject in the JOURNAL of Dec. 12 I wish to state that sand filling has been in use for several years at the Foldal Copper Co.'s mines at Foldalen, Norway.

There have been installed several kilometers of aërial ropeways from the river bottom whence the sand is taken to the mines, where the sand is guided to its place through iron pipes from the surface. The system has proven very satisfactory.

Vantrent, Calif., Jan. 2, 1915. N. A. SANSTEBY.

Editorials

The Rise in Copper

We doubt if any further rise in copper is to be regarded with the same enthusiasm as is exhibited by those gentlemen who are trying to engineer a boom in copper shares. If the unsold accumulation of copper has been reduced to a moderate figure, a rise is, of course, justified; and if the tendency continues to be to draw further on stocks some resumption of the former scale of production will be justified. The ideal condition would be a price of about 14½c. per lb., net cash, New York, for copper and a production substantially adjusted to the demand for copper at that price. There is need, however, to proceed very cautiously in departing from the previous basis of copper production, reduction to which was the only thing that saved the copper industry last fall. The present danger is that some producers will forget that we are still deprived of our largest customer, Germany, that domestic consumption in this country is still not what it ought to be, and that the present large demand for copper is to a considerable extent for military purposes; and forgetting these things will be tempted to increase output and produce conditions from which we may suffer later.

Production of Spelter in 1914

The production of spelter in the United States in 1914 was reported by us, in our annual number, Jan. 9, 1915, as 360,789 tons, the output of one small smelting company, which did not report, being estimated at the same figure as in the previous year. Most of the producers gave their production by quarters, but two, one small and the other large, reported only their totals for the year. Both of these, however, were producers who operate under especially uniform conditions, their production varying but little either from year to year or from quarter to quarter, and by prorating their productions for the year we may obtain an approximate idea of the total production of the United States in 1914 by quarters, and may compare it with the corresponding figures for 1913, as follows:

Quarter	1913	1914
I	92,082	87,791
II	94,336	90,599
III	83,062	90,523
IV	88,782	91,876
Total	358,262	360,789

The chief curtailment of production occurred in the third quarter of 1913. During the first half of 1914 two works in Kansas went out of operation and another large plant reported only a nominal production. Two of the Kansas plants which suspended in 1913 were idle throughout 1914. Three of the survivors of the old coal-fired plants were also idle throughout 1914 and one of them was scrapped. These three coal-fired plants had an aggregate of 3094 retorts. The five gas-fired plants had an aggregate of 14,464 retorts.

The time when a zinc-smelting works should be removed from the list of smelting capacity is uncertain. When a plant is scrapped, as was the plant at Nevada, Mo. (648 retorts), in 1914, there is no doubt about the end having come, but almost always there is a period in the latter part of the life of a zinc smeltery when it is inactive but potential. This was the position of seven works with an aggregate of 16,910 retorts at the end of 1914. It is improbable that the five idle gas-fired smelteries of Kansas will ever obtain a new lease of life, but they will no doubt be fitfully employed, just as were the gas-fired plants of Indiana as their ending drew nigh.

The increase of production in the second quarter of 1914 was due chiefly to two large plants of Illinois, which brought new capacity into use. Among the other plants of the country there were some increases and some decreases. The record of the fourth quarter was similar, but a new plant in Oklahoma had come into operation. On the other hand, one of the big plants of Kansas made a considerably diminished production, advantage having been taken of an opportune time to reline some of its furnaces.

The production of bonded spelter in 1914 was 5950 tons, compared with 5904 tons in 1913. The exports of bonded spelter in 1914, as reported by the several smelters, amounted to 6620 tons.

In 1912 there was a production of 492 tons of commercial zinc dust. In 1913 the production was 380 tons. After the outbreak of the war the high price for this commodity induced several smelters to engage in its preparation and the production in 1914 was 750 tons, with strong probability that the amount will be larger in 1915.

Our statistics of spelter production are based, as for a long series of years, upon the reports of what we class as "ore smelters" and include the entire product of such smelters. At the beginning of 1914 these concerns held 40,115 tons of spelter in stock at their works; at the middle of the year about 64,000 tons; at the end about 23,500 tons. We refrain from trying to compute consumption or deliveries, about which it is impossible to do anything more than guess.

The total supply of spelter is the sum of what is produced by the ore smelters and the dross-and-scrap smelters. The aggregate output of the latter is large and some of the smelters of that class are of very respectable caliber, certain of them turning out nearly as much as 10,000 tons per annum, and a good deal of their spelter is as good as, or even superior to, prime Western virgin spelter.

The U. S. Geological Survey in reporting spelter production makes a distinction between primary and secondary, the former being limited to what is directly derived from ore, and the latter comprising what is recovered from other products. Such recovery is practiced by (*a*) remelting and (*b*) redistillation. In pursuing a statistical investigation there are so many opportunities for confusion and errors of both omission and commission that results are next to meaningless unless there be precise definitions of just what they represent. For example, some consumers remelt their own scrap, others send it

to outside smelters for resmelting on toll and have it returned to them, while others sell it outright and let it reappear as marketable spelter. What shall be reckoned in the statistics? Again, among the smelters there are some who treat dross-and-scrap only, while there are others who smelt a little ore along with the dross and scrap, and others who smelt ore chiefly but take a little dross and scrap. The ore smelters produce annually from 8000 to 10,000 tons of spelter that is derived from dross, skimmings, etc. What the U. S. Geological Survey wants to know is the quantity of spelter derived from ore. What we want to know is the production of spelter that is destined to be marketed. The combination of statistics of part of the marketable production with part of the stock in smelters' hands and the exports as reported from ports to which spelter is two weeks or more in transit from the smelteries does not permit of any very reliable deductions as to deliveries for domestic consumption, and still less as to domestic consumption itself.

The Directorship of the Mint

The Bureau of the Mint is one of the offices in Washington with which the mining industry, especially the gold- and silver-mining industry, comes intimately in contact. In certain ways it comes more intimately in contact with this than with any other, there being in fact the relations of buyer and seller. A very large part of the production of gold and silver is taken by the Mint and is sampled, assayed and settled for just as by a private smelter and refiner.

The Mint is moreover an important factor in the collection and reporting of the gold and silver statistics of the country. Until a few years ago it was the sole factor. The main work of the Mint is in fact a metallurgical and metal manufacturing business.

George E. Roberts, who was a successful director of the Mint during many years, lately resigned. Since then his place has been filled by Frederic P. Dewey as acting-director. The appointment of a new director will be made by the President ere long.

It is very rare indeed that the JOURNAL advocates the appointment of any person to public office, but we think that we may say that the mining and metallurgical industry would be very much pleased if the President should appoint Mr. Dewey director of the Mint.

Mr. Dewey has been assayer of the Mint for upward of a score of years and is an analyst of high distinction, indeed an authority in his science, and a metallurgist of no little reputation. Just as Roberts-Austen was for many years assayer of the British Mint and was finally honored by being made Master of the Mint, it would be fitting that Mr. Dewey should be so honored here.

With such an opportunity awaiting the President, we should feel badly to see the directorship of the Mint assigned to a politician, a time-server, or a lame-duck.

A Novelty in Placer Mining

The article by Mr. Hartley on "The Opportunities in Placer Mining," which appears elsewhere in this issue, is suggestive. Mr. Hartley reveals a vision, but we understand that he has a very substantial basis for his dream.

Such a procedure as he outlines can be proved only by actual operation and, moreover, by an operation for a considerable period. We understand that this has been done in one case, a certain plant treating 500 cu.yd. per 10 hours in the way suggested by Mr. Hartley at a cost of about 15c. per cubic yard.

Some Figures of Industrial Insurance

In the Nevada Consolidated Copper Co.'s excellent monthly bulletin, *Safety First,* for October, 1914, are given some illuminating figures of the economic workings of the state industrial-insurance act. In the year ending June 30, 1914, 328 mining companies paid $154,394 in premiums, of which Nevada Consolidated paid $49,424. The total number of employees in mines, mills and smelting works protected by the industrial-insurance act averaged 8863, of which 2437 were employed by the Nevada Consolidated.

The employees of the Nevada Consolidated received compensation to the amount of $30,926. It is provided in the industrial-insurance act that 10% of the premiums shall be used to pay the administration expenses, and that another 10% shall be set aside as a reserve fund. Adding these percentages to the sums paid out by the commission, the Nevada Consolidated employees got back 82% of what the company paid in. In other words, the company paid into the state insurance fund a total of $49,424, of which $40,811 was devoted to the protection of its employees.

Other figures are even more interesting. By the provisions of the industrial-insurance act, compensation is not allowed for injuries resulting in disability for less than 14 days. The commission, however, has kept a record of all accidents resulting in personal injury. Summarizing these data, the wage loss of employees of the Nevada Consolidated in 12 months averaged $1.27 per man per year, while the wage loss of employees at all other mining companies in the state was $2.17 per man per year, based on the average number of men employed.

These figures are interesting and instructive in several ways, viz., for the economy with which the administration of the state insurance system is conducted; for the relatively small loss of time that is suffered by the miners, millers and smelters of the state by reason of industrial accidents; and finally, the very favorable showing in this respect that is made by the Nevada Consolidated, which has distinctly been a leader in the movement of "Safety First."

The Institute Amendments

Doctor Raymond, in a further communication about the Institute amendments, elsewhere in this issue, makes the effective point that the A. I. M. E. is an international organization. It has a great many members in foreign countries, but especially a large number in Canada. Are foreigners to be asked to vote upon questions of American policy, asks Doctor Raymond, and is the Institute to consider questions of Canadian and Mexican policy, as well as American?

A distinguished member of the Institute in Colorado addressed the following letter to the secretary of the Institute:

With reference to announcement No. 5, dated Dec. 28 last, of the Institute, which has just reached me, I respectfully pro-

test against the manner in which the proposed amendments to the constitution are set forth. Announcement No. 5 shows neither the wording of the original articles, which it is proposed to change, nor the proposed changes. While briefly summarized arguments pro and con are submitted, there is no means of ascertaining, from the announcement itself, what bearing the arguments have on the questions at issue. The voting slip shows the proposed new wording only.

Any member reading the new articles, by themselves, without referring to the present constitution (a copy of which he might not happen to have conveniently at hand) would naturally suppose them to be entirely unobjectionable; whereas if he were shown the originals and the proposed amendments side by side, he would at once be able to gage precisely the effect of the proposed changes.

The directors of the Institute appointed a committee to present to the members the pros and cons of the pending amendments. If the committee failed to make the case clear in such a matter as amendments to the constitution, a similar obscurity is to be reckoned as a danger in less fundamental cases. This is always one of the difficulties of the letter-ballot system.

The Copper Producers' Association was dissolved on Jan. 13. This was generally expected. Some of the remarks that have been made about its demise are amusing. It was never intended to be an altruistic organization, or one to be conducted merely for the benefit of the public. It was a certain expense to the copper producers, and when they saw that it was of no advantage to them it was merely common sense to discontinue it. As soon as certain of the producers resume their monthly reports we shall have regular returns of the smelters' production and the Government will report the exports. Except for the matter of stocks, the principal items necessary to show about how copper stands will be available.

BY THE WAY

The latest recruit to the ranks of safety-first publications is the *Anode*, got out by the Anaconda company and entirely up to the standard of all Anaconda work. In fact it is one of the best looking safety-first magazines that has come to this office. What counts for more than looks is the fact that it is full of good articles, brief, interesting, authoritative and to the point. We note short accounts of the progress of safety work in the mines, the railway, the reduction works, and the other departments of the Anaconda Copper Mining Company.

The Stock Exchange firm of A. A. Houseman & Co., in a recent market letter, writes as follows respecting some possible effects of the war:

Under all its disabilities we dare say the world today is saving capital faster than before the war started. It was saving very little before. The trouble economically was that the world's expenditures had overrun its ability to save, hence the rise in the price of capital everywhere in the last few years. Nobody can predict with certainty what the economic effects of the war will be, but here are things to think about. The world obviously has been arrested in its rakish career. It has broken off suddenly with the habits of the spendthrift. New habits are forming, and they will continue long after all physical traces of war have disappeared.

The war has caused 500,000,000 of people to begin to save even their potato peelings. It has caused 200,000,000 people in Russia to be sober, all at one time, a thing that never happened in this world before. It has caused you and your neighbor in this country to reduce household expenses and to stop spending money on unnecessary things. It has suddenly checked the waste of capital by individuals, by corporations and by the government, for even the government is seized with a spirit of economy. Of course, there is much unemployment in consequence, and some of the readjustments are painful, but the economic effect will be wonderfully beneficial, and the ratio of productive to unproductive labor, in the economic sense, will be higher afterward.

We are very skeptical about the world accumulating capital faster than before the war started and also about the war being economically a good thing, but we are ready to agree that the new spirit of economy is an ameliorating condition in what is an extremely bad mess.

Uncle Sam is a good deal of an artist in some kinds of sharp practice. Thus it appears that since the outbreak of the war, the Government has shipped nearly 200 tons of gold from Philadelphia to New York and bilked the railways out of the freight by sending it by parcel post instead of by express as formerly. The largest single shipment was 100 tons, for which the railroads had to furnish four special cars and haul them part of the way by special locomotives. The Postmaster General cackles over running his department at a profit, but the ways and means thereof look to us very much like downright cheating. Some one, we believe, has computed that Uncle Sam is skinning the railroads out of about $8,000,000 per annum in the parcel-post business.

The Gentleman Mucker

By Berton Braley

The gentleman mucker comes out from the East
In his niftiest college clothes,
With the legs of his trousers nicely creased
And the classiest sort of hose,
But he changes his tweeds for overalls
His coat for a flannel shirt
And down on a level he works like the devil,
Shoveling copper dirt!

For he is a gentleman mucker
Who's learning the miner's trade,
Who acts as an ore-car trucker
And pushes it up the grade,
He has to sweat, you bet, to get
The wages that he is paid;
But he's learning a lot in his new employ—
The gentleman mucker's Quite Some Boy!

The day's work ends and the miners troop
Toward home or a near hotel,
And the gentleman mucker eats his soup
And his porterhouse steak as well;
Then he tumbles out of his flannel shirt
And his muddified overalls,
And away he goes in his evening clothes
Making a round of calls!

For he is a gentleman mucker
In the swellest of "happy duds,"
In his nobbiest bib and tucker
His shirt with its gleaming studs,
At night, all right, he's a handsome sight,
The gayest of gay young bloods!
The hostess' pet and the ladies' joy,
The gentleman mucker's Quite Some Boy!

The gentleman mucker learns the ropes
And he talks in the miners' slang,
Of "chutes" and "raises" and "sumps" and "stopes,"
Of mining he gets the hang,
And the first you know he's a man of fame
And boss of a mine or two,
And he digs no more in the copper ore
With the mucking job he's through!

But he's proud he was once a mucker
Who worked in the mine below,
This fellow who wouldn't tucker
But ever was on the go,
A man whose plan was "Sure I can,
If you'll give me half a show!"
A right good man in a good employ,
The gentleman mucker's QUITE SOME BOY!

PERSONALS

J. W. Mercer has just returned from six months in Ecuador.

H. V. Winchell expects to be in New York during February.

J. V. N. Dorr has gone to Denver to remain about a month on business.

Charles L. Lawton, of the Quincy Mining Co., has been visiting New York.

Dr. Eugene Haanel, director of mines of Canada, has been elected vice-president of the Faraday Society of England.

Samuel Hale has resigned as general manager of the Algoma Steel Co., Ltd., Sault Ste. Marie, Ont. There has been no appointment of a successor.

R. C. Canby has gone to Miami, Ariz., where he will be until February, in connection with the flotation case which is expected to come up for trial in Delaware this spring.

T. H. Jenks, of Denver, Colo., having completed some mining examinations in Arizona, is now engaged upon professional work at Blend, in the Cochiti District in New Mexico.

Dr. T. Poole Maynard of the association of Maynard-Carter-Simmons, geological, mining and civil engineers, is taking up his residence in Atlanta, Ga., and will have charge of the Atlanta office.

L. D. Ricketts has gone to Miami, Ariz., where he expects to remain until next summer, attending to the starting-up of the Inspiration mill and the new smelting works of the Anaconda company.

A. E. Borie has resigned as chairman of the board of directors of the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., in order to devote his time to some other business. He remains a director of the company.

Hubert Merryweather, formerly with the Juragua Iron Mines Co., of Cuba, is now vice-president and general manager of the Bethlehem-Chile Iron Mines Co., operating the Tofo iron mines near Coquimbo, Chile.

Walter M. Rossberg, superintendent of the Timber Butte Milling Co., of Butte, Mont., has been visiting in New York. He is going to visit some of the zinc-smelting works in Oklahoma on his way home to Butte.

S. R. Guggenheim has been chosen president of the Braden Copper Co. and the Braden Copper Mines Co. in place of the late Barton Sewell. John K. McGowan has been elected a director in both companies to succeed Mr. Sewell.

P. E. Hart, late resident engineer of the Donada Ry. ropeway extension at Honda, Colombia, has left that position and returned to England, where he now holds a commission in the Royal Garrison Artillery. He expects to leave for the front soon.

Paul W. Meyers, formerly with L. H. Taylor, Jr., in Philadelphia, sailed from New York, Jan. 20, to take a position in the Cauca Valley, in Colombia, with the Colombia Exploration Syndicate of Philadelphia. His address is care Empress Hauseatic, Barranquilla, Colombia.

Henry D. Bolsinger, James A. Shinn and Thomas Mansfield left Central City, Colo., about seven weeks ago to visit the Nuevo Deloro mine, some 50 miles from Almos, Mexico. Nothing has been heard from them since they left Almos in December, and a search is now being made for them.

Forty-five men have enlisted at Cobalt, Ont., in Major Holland's automobile quick-firing gun battery, nearly all of whom are prospectors. The list includes many whose names are well known in mining circles since the early days of the Cobalt and Porcupine camps. Among them are Alex Gillies, "Doc." Dowsley and Alexander McIntyre.

Roswell H. Johnson and L. G. Huntley announce that they have opened an office in Pittsburgh, Penn., under the name of Johnson & Huntley, for undertaking examinations and reports on oil and gas properties. Professor Johnson is professor of geology, University of Pittsburgh. L. G. Huntley leaves the office of the Associated Geological Engineers at Pittsburgh.

A bequest of $3,000,000 to Oberlin College by Charles M. Hall, the distinguished electrochemist and manufacturer of aluminum, is announced. The bequest includes a $2,000,000 endowment to be used for any purpose, $500,000 to be used to build an auditorium, $100,000 for the auditorium's maintenance, $200,000 to be spent for campus improvements; all property in Oberlin owned by Dr. Hall, and a valuable art collection.

OBITUARY

Dr. William D. Crumbie died at his home in East Orange, N. J., Jan. 16, aged 60 years. He was born at Milburn, N. J., and graduated from the Columbia School of Mines. He devoted himself to metallurgical chemistry, and had been for 32 years in the New York Custom House, where his services as metallurgist and expert examiner were highly valued.

SOCIETIES

Technology Clubs, Associated—The third annual convention will be held at Pittsburgh, Feb. 19 and 20. Arrangements are in charge of the Pittsburgh Association.

Mackay School of Mines—The Nevada State Mining Laboratory has been made a department of this school at Reno. During 1914, 6533 Assays were made in this laboratory free of charge for prospectors and miners.

Colorado School of Mines—The short course for prospectors, heretofore mentioned, will be given at Golden, beginning Feb. 8, 1915, and continuing for three weeks. No fees will be charged for this course other than a nominal charge to cover the cost of supplies used, which should not exceed $3. The course is open to prospectors and others interested in the more intelligent prospecting of our mineral areas.

Colorado Metal Mining Association—The second annual convention was held at the Brown Palace Hotel, Denver, Jan. 11-13, the program shows a meeting devoted chiefly to reports of committees, and to the arrangement and division of the work for the ensuing year. The association was organized in Denver, Feb. 19, 1914, at which delegates from 29 metal mining counties were present. The objects are to foster and encourage the metal and rare-mineral mining industry and all its branches; to stimulate coöperation between the metal mining districts of Colorado; to aid in the development of the mineral resources of Colorado; and, generally, to further and promote all the mining interests of the state. The association maintains branches in each county.

Northwest Mining Convention—The meeting under the joint auspices of the Spokane Chamber of Commerce, Mining Men's Club and Spokane Engineering & Technical Association will take place Feb. 24-27, at the Hotel Spokane, Spokane, Wash. From every mine in Idaho, British Columbia, Montana, Oregon and Washington will be invited mineral displays, and every effort will be made to bring the investing public into touch with the owners of promising properties. H. H. Shallenberger is chairman of the committee in charge of the ore exhibition. The convention side of the event is being arranged by the Spokane Engineering & Technical Association. The Spokane chapters of the American Society of Civil Engineers and the American Institute of Electrical Engineers, and the Columbia Section of the American Institute of Mining Engineers each will have charge of a day's program at the convention. L. K. Armstrong, a mining engineer, is chairman of the convention program committee.

Michigan College of Mines—Some additions to the equipment of the ore dressing and metallurgy department have recently been made at this college. A machine for testing ores by flotation, of size and type generally used in experimental mills, and made by the Minerals Separation Co. has been loaned to the college. Another machine for testing by flotation is being constructed at the school, the blueprints having been furnished by the Inspiration Consolidated Copper Co. The electrolytic laboratory has been overhauled and placed in condition to demonstrate the latest methods. The crushing and grinding room has been fitted with a new "chipmunk" crusher, and a standard size Wilfley table has also been installed. The purchase of the new equipment was made possible through the gold recovered from ores treated at the College mill.

The extension lectures of the college, on "The Copper Industry in Michigan," will be given this year between Jan. 28 and Feb. 17, at Big Rapids, Adrian, Mt. Pleasant, Grand Rapids, Detroit, Monroe, Nashville, Plainwell, Otsego, Allegan,

Wyandotte, Tecumseh, Powers, Escanaba and Iron Mountain, all in Michigan. These lectures, which are given by Professor Grant, of the mathematical department, are illustrated by slides showing the geology of the district, the underground workings, mills and smelters.

University of Illinois—The university has since 1907 maintained 10 research fellowships in the Engineering Experiment Station. These fellowships, for each of which there is an annual stipend of $500, are open to graduates of approved American and foreign universities and technical schools. Appointments to these fellowships are made and must be accepted for two consecutive collegiate years, at the expiration of which period, if all requirements have been met, the master's degree will be granted. Not more than half of the time of the research fellows is required in connection with the work of the department to which they are assigned, the remainder of the time being available for graduate study. Nominations to fellowships, accompanied by assignments to special departments of the Engineering Experiment Station, are made from applications received by the director of the station each year not later than Feb. 1. These nominations are made within the month of February by the station staff, subject to the approval of the faculty of the Graduate School and the president of the university. Appointments are made in March, and they take effect Sept. 1. Nominations to these fellowships are based upon the character, scholastic attainments and promise of success in the principal line of study or research to which the candidate proposes to devote himself. Preference is given those applicants who have had some practical engineering experience following their undergraduate work. There are four vacancies to be filled this year.

Canadian Mining Institute—At a recent meeting of the Toronto Branch, President Lindsey gave some account of the condition of affairs of the Institute, and asked members not to forget that the Institute needs their assistance more than ever this year on account of conditions brought about by the war. Mr. Dowling gave some account of the situation in the Calgary oil field.

INDUSTRIAL NEWS

The Western Pipe & Steel Co. has just sold to the Round Mountain Mining Co. nine miles of riveted steel water pipe $\frac{1}{16}$-in. gage, average diameter 15 in. A small amount of this pipe was lap welded.

The Mesta Machine Co., of Pittsburgh, has recently acquired the rights from the Stumpf Una-Flow Engine Co., of Syracuse, N. Y., to build the Stumpf Una-Flow type of engine in the United States.

Joseph T. Ryerson & Son, of Chicago, is conducting a contest in which prizes will be awarded for the best suggestions for a name to cover the tool steels handled by this company. Details will be sent by it on request.

W. G. Swart, of Denver, Colo., has joined the Hardinge Conical Mill Co., in the capacity of consulting engineer in the West. His office is in the Foster Bldg., Denver, and he will assist users of the Hardinge mill in the proper selection and operation of their machines.

A new paste for making up pipe joints is being marketed by Chard & Howe, of New York. It is adapted to steam, oil, water, air, gas, and ammonia plants and piping; has three time the bulk of red lead, is not poisonous; and does not harden or dry out. A test was seen on a badly cut joint in which this paste stood 600-lb. pressure.

The Merrill Metallurgical Co. has recently secured a large contract for Merrill automatic sluicing slime filters from the Aurora Consolidated Mines Co., of Aurora, Nev. The equipment will include three 124-frame, 3 ft. by 4 ft. by 2½-in. filters of the most improved design, and will have a minimum capacity of 500 tons of slime per day.

The Erie Pump & Engine Works, of Erie, Penn., reports that it has recently been consolidated with the Northern Equipment Co. The new name is the Erie Pump & Equipment Co. John G. Pfadt, former president of the old works, is no longer connected in any way with the new concern. John H. Dougherty is in charge of the designing of the pumps.

The Orenstein-Arthur Koppel Co., of Koppel, Penn., has just perfected a new locomotive embodying two distinctly new features, a flexible diamond shaped trolley and a double truck, permitting the use of the car on track layouts where sharp curves are encountered. It can take a curve of even 12-ft. radius while hauling a train, without excessive power being required and without derailment.

The Westinghouse Electric & Manufacturing Co. has just issued a preliminary statement of a liberal plan covering sickness and accident relief, accident compensation and service pensions. The relief department is maintained by the employees by the payment of small monthly dues, but all dues are used for benefit payments, the company paying the operating expenses of the department. It also duplicates the employees' contributions for death benefits. The accident compensation plan covers total and partial disability and death. For total disability the company pays two-thirds wages during its entire duration; for partial disability it pays an amount equal to two-thirds of the reduction in earning power. The pension system provides for retirement at 70, and for those who are members of the relief department and have completed 20 years of continuous service are to be granted a pension of 1% of their average monthly wages during the last 10 years, for each year of continuous service, with a minimum of $20 per month and a maximum of $100. Widows' and dependent children's pensions are also provided for.

TRADE CATALOGS

Burd High Compression Ring Co., Rockford, Ill. Catalog. Directory of Piston Ring Sizes. 68 pp., illus., 4½x6½ inches.

The Neil & Smith Electric Tool Co., Cincinnati, Ohio. Catalog No. 4. Portable Electric Tools. Fifty-six pp., illus.; 9x6 inches.

The Armstrong Cork Co. has issued a booklet, "Permanent Fortifications," on the insulation of pipes against heat or cold with cork.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Penn. Bulletin 3002-A. Central Station Power in Coal Mines. 16 pp., illus., 6x9 inches.

Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, Ill. Bulletin No. 34-K. Fuel Oil and Gas-Driven Compressors. 24 pp., illus., 6x9 inches.

The Lagonda Manufacturing Co., Springfield, Ohio, has just issued a new Bulletin Lagonda Boiler Tube Cleaners. Copies may be had upon request.

American Steam Gauge & Valve Mfg. Co., 19 North Market St., Boston, Mass. Booklet. Steam Boilers and Boiler Feed Water. Eight pp., 8x5 inches.

The Waterbury Co., 80 South St., New York, has issued a new catalog descriptive of their "Fiberclad" wire rope. This a wire rope of standard construction except that each strand is covered with tarred Russian marlin.

What is probably the most complete commercial publication devoted solely to centrifugal pumps is being distributed by the De Laval Steam Turbine Co., of Trenton, N. J. This book has 298 pages and over 300 illustrations.

The Western Electrical Co. issued its "Electrical Supply Year Book" in the shape of a veritable encyclopedia of 1216 pages. That a firm should find so voluminous a catalog necessary is a testimonial that renders any other unnecessary.

Goodyear Tire & Rubber Co., Akron, Ohio. Catalog. Mechanical Rubber Goods. 109 pp., illus., 6x9 inches. Other Goodyear booklets received recently are devoted respectively to: Flat Conveyor Belts; Mine Equipment; Balata Belting and Kantkink Flexible Metallic Hose.

"Cochrane Multiport Valves"—A booklet of 72 pages, just issued by the Harrison Safety Boiler Works, Philadelphia, Penn., describing the multiport valves introduced by that company for back pressure, relief and vacuum service, flow service in connection with mixed flow turbines, and check-valve service with bleeder or extraction turbines. The essential idea of the multiport valve is the use of a number of small disks instead of one large disk, in order to secure greater safety, quietness, lightness of moving parts, and tightness.

Connersville Blower Co., Connersville, Ind., Catalog No. 16. Connersville Cycloidal Pumps. 48 pp., illus., 9x12 inches. This catalog, prefaced by a short account of "More than 20 Years of Successful Manufacturing," reviewing the steady growth of the Connersville Blower Co.'s business, deals especially with this company's line of two-impeller cycloidal rotary pumps, used in power houses for circulating pumps, in irrigation work and other low-lift service. The catalog is handsomely illustrated with half-tone illustrations of actual installations, and diagrams both of two-lobe and three-lobe impellers, the latter type being adapted to higher lifts.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ALKALI-SILICO-ALUMINATE—Method of Making Alkali-Silico-Aluminate. Alfred Hutchinson Cowles, Sewaren, N. J., assignor to The Electric Smelting & Aluminum Co., Sewaren, N. J. (U. S. No. 1,123,693; Jan. 5, 1915.)

ALKALI METALS—Treatment of Chlorides of the Alkali Metals for the Obtainment of Useful Products Therefrom. James Alfred Kendall, Streatham, London, England. (U. S. No. 1,124,143; Jan. 5, 1915.)

AMALGAMATING PROCESS. Royer Luckenbach, Darby, Penn., assignor to Russell Thayer, Philadelphia, Penn. (U. S. No. 1,124,482; Jan. 12, 1915.)

AMALGAMATOR. James P. Dovel and Charles C. Glidden, Birmingham, Ala. (U. S. No. 1,123,116; Dec. 29, 1914.)

BORE HOLES—Apparatus for Measuring the Inclination of Bore Holes and Making a Photographic Record Thereof. Hermanus Mattheus Smitt, Utrecht, Netherlands. (U. S. No. 1,124,068; Jan. 5, 1915.)

CAST IRON—Process of Treating Cast Iron. J. E. Johnson, New York. (Brit. No. 24,297 of 1913.)

CEMENT—Process of Making Hydraulic Cement. William R. Warren, New York, N. Y. (U. S. No. 1,123,964; Jan. 5, 1915.)

CHLORIDIZING ROASTING OF ORES, Method for. Arthur Ramén and Knut Jakob Beskow, Helsingborg, Sweden. (U. S. No. 1,124,519; Jan. 12, 1915.)

CONCENTRATION—Adjustable Swinging Spray for Mineral-Washing. Wilton E. Darrow, Sutter Creek, Calif. U. S. No. 1,123,254; Jan. 5. 1915.)

CONDUIT SYSTEM for Mines. Louis Zwiesler, Kansas City, Mo. (U. S. No. 1,120,880; Dec. 15, 1914.)

CONVERTER. Herbert Haas, San Francisco, Calif. (U. S. No. 1,123,868; Jan. 5, 1915.)

COPPER—Process of Extracting Copper from Ores. Noak Victor Hybinette, Christiania, Norway. (U. S. No. 1,122,759; Dec. 29, 1914.)

COPPER—Process of Hardening and Welding Copper. Charles Bittner, Stafford, Kan. (U. S. No. 1,122,062; Dec. 22, 1914.)

CRUCIBLE FURNACE. Grenville Mellen, Mount Vernon, N. Y. Filed Feb. 23, 1911. (U. S. No. 1,120,732; Dec. 15, 1914.)

CRUSHER. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher & Pulverizer Co., St. Louis, Mo. (U. S. No. 1,122,453; Dec. 29, 1914.)

CRUSHING MILL. Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co. (U. S. No. 1,122,552; Dec. 29, 1914.)

CYANAMIDE—Process of Producing Calcium Cyanamide. Dettifoss Power Co., Ltd., and J. H. Lindholm, London, Eng. (Brit. No. 3547 of 1914.)

CYANIDING—Precipitant for Recovering Metals from Solutions. Galen Howell Clevenger, Palo Alto, Calif., assignor to Merrill Metallurgical Co. (U. S. No. 1,123,685; Jan. 5, 1915.)

CYANIDING—Precipitating Metals from Solutions. Louis David Mills, Johannesburg, Transvaal, South Africa, assignor to Merrill Metallurgical Co. (U. S. No. 1,123,778; Jan. 5, 1915.)

DREDGE. Benjamin Bernard, Seattle, Wash. (U. S. No. 1,123,982; Jan. 5, 1915.)

DRIER for Ores, Sand, Etc. Bernard R. Behnke and Vernon Keech, Mount Iron, Minn. (U. S. No. 1,123,222; Jan. 5, 1915.)

DRILL. Albert Scott and Joseph George Grattan, Vancouver, B. C. (U. S. No. 1,124,337; Jan. 12, 1915.)

DRILL—Fluid-Operated Percussive Tool. Caid H. Peck, Waverly, N. Y., assignor to Ingersoll-Rand Co., Jersey City, N. J. Filed Apr. 28, 1914. (U. S. No. 1,122,630; Dec. 29, 1914.)

DRILL SHARPENER. Theodore Hiram Proske, Denver, Colo. (U. S. No. 1,123,372; Jan. 5, 1915.)

DRILLING—Combined Drill-Bit-Holding Chuck and Front Cylinder-Head for Rock-Drilling Engines. John George Leyner, Denver, Colo. (U. S. No. 1,124,627; Jan. 12, 1915.)

DRILLING—Fastening Device for Boxes for Mine Drilling Machines. George Griffith, Des Moines, Iowa, assignor of one-half to John M. Ferguson, Des Moines, Iowa. (U. S. No. 1,123,731; Jan. 5, 1915.)

DRY SEPARATOR and Concentrator. Fritz Henry Gordon, Portland, Ore. (U. S. No. 1,123,728; Jan. 5, 1915.)

ELECTROLYTIC DEPOSITION of Metals from Solutions, Process of. Noak Victor Hybinette, Christiania, Norway. (U. S. No. 1,123,299; Jan. 5, 1915.)

EXTRACTION—Improvements in and Relating to the Extraction of Metals from Ores. J. Caldwell, Mexico City. (Brit. No. 15,711 of 1913.)

FERRO-CHROMIUM—Process of Manufacturing Ferro-Chromium. Hans Goldschmidt and Otto Weil, Essen-on-the-Ruhr, Germany, assignors to Goldschmidt Thermit Co., New York, N. Y. (U. S. No. 1,122.907; Dec. 29, 1914.)

FURNACE—Metallurgical Furnace. Utley Wedge, Ardmore, Penn. (U. S. Nos. 1,123,965; and 1,123,966; Jan. 5, 1915.)

FURNACE WALL. Josef Hemmer, Veitsch, Austria-Hungary, assignor to Veitscher Magnesitewerke Actien-Gesellschaft, Vienna, Austria-Hungary. (U. S. No. 1,123,874; Jan. 5, 1914.)

GAS WASHING. Hermann A. Brassert and Charles J. Bacon, Chicago, Ill. (U. S. No. 1,123,232; Jan. 5, 1915.)

GOLD-SAVING DEVICE. Joseph B. Green, Seattle, Wash., assignor to Monarch Engineering Co., Seattle, Wash. (U. S. No. 1,123,188; Dec. 29, 1914.)

GOLD-SAVING MACHINE. Frank A. Monroe, Jamestown, N. Y. (U. S. No. 1,124,501; Jan. 12, 1915.)

HARDENING IRON AND STEEL, Method of. Eli Sweet, Binghamton, N. Y., assignor to Joseph W. Boyd, Denver, Colo. (U. S. No. 1,121,572; Dec. 15, 1914.)

HOT-BLAST SYSTEM. Albert S. Hanson, Billings, Mont. (U. S. No. 1,123,526; Jan. 5, 1915.)

MAGNETIC QUALITIES OF ALLOYS—Process for Improving the Magnetic Qualities of a Magnetic Body. Robert Abbott Hadfield, Sheffield, England. (U. S. No. 1,122,385; Dec. 29. 1914.)

MANGANESE STEEL—Heat Treatment of Manganese Steel. Winfield Scott Potter, Pittsburgh, Penn. (U. S. No. 1,123,003; Dec. 29, 1914.)

MELTING FURNACE. Pietro Vergnani, Somerville, Mass. (U. S. No. 1,121,957; Dec. 22, 1914.)

MINE CAR—Dumping Mine Car. Charles Layton, Mount Pleasant, Penn. (U. S. No. 1,124,147; Jan. 5, 1915.)

NICKEL-BEARING ORE—Improved Process of Extracting Cobalt or Nickel and Copper from Cobalt- or Nickel-Bearing Copper. L. J. G. de Burlet, Hoboken, Belgium. (Brit. No. 27,150 of 1913.)

NODULIZING ORES. Niels S. Borch, Copenhagen, Denmark. (U. S. No. 1,123,672; Jan. 5, 1915.)

ORE CAR. William S. Atwood, Montreal, Que., assignor to Canadian Car & Foundry Co., Ltd., Montreal, Canada. (U. S. No. 1,123,655; Jan. 5, 1915.)

OXYACETYLENE CUTTING TORCH. Prior F. Willis, St. Louis, Mo. (U. S. No. 1,119,917; Dec. 8, 1914.)

PHOSPHATES—Method of Drying Superphosphates and the Like. Thomas Leopold Willson and Maximilian Mattheus Haff, Ottawa, Ont., assignors, by direct and mesne assignments, to Southern Ivestment Co. of Canada, Ltd., Montreal, Canada. (U. S. No. 1,122,183; Dec. 22, 1914.)

PIGMENTS—Process of Making Pigments. Clifford D. Holley, St. Louis, Mo., assignor to Acme White Lead & Color Works, Detroit, Mich. (U. S. No. 1,123,743; Jan. 5, 1915.)

PLACER MINING—Separator and Classifier for Placer Material, Ground Ore, and the Like. Edwin B. Goodwin, Boulder, Colo. (U. S. No. 1,122,908; Dec. 29, 1914.)

PLACER-MINING MACHINE. Arthur E. Custer, Salt Lake City, Utah. (U. S. No. 1,121,985; Dec. 22, 1914.)

POTASSIUM AND ALUMINUM, Process of Producing Soluble Salts of. Melville F. Coolbaugh and Elwyn H. Quinney, Rapid City, S. D. (U. S. No. 1,125,007; Jan. 12, 1915.)

REFRACTORY UTENSILS—Method of Manufacturing Utensils and the Like from the Oxides of the Rare Earths, Thorium Oxide, Zirconium Oxide and the Like. Hans Arnold, Charlottenburg, Germany, assignor to The Firm of Dr. O. Knöfler & Co., Plotzensee, near Berlin, Germany. (U. S. Nos. 1,121,889 and 1,121,890; Dec. 22, 1914.)

ROASTING FURNACES—Improvements in Rabble Arms for Roasting Furnaces. H. H. Stout, New York. (Brit. No. 15,643 of 1914.)

SAFETY DEVICE for Muffles, Cupolas, and other Furnaces. Ernst Beling, Vienna, Austria-Hungary. (U. S. No. 1,121,969; Dec. 22, 1914.)

SCREEN—Pulsating Screen for Pulp and the Like. Theodor Qviller, Lilleströmmen, near Christiania, Norway. (U. S. No. 1,124,802; Jan. 12, 1915.)

SLAG STEAM GENERATOR. Charles H. Smoot, New York, N. Y., assignor to Slag Steam Generator Co., New York, N. Y. (U. S. No. 1,121,946; Dec. 22, 1914.)

SMELTER GASES—Apparatus for Collecting Solids Suspended in Gases. Willard E. Playter, Collinsville, Ill. (U. S. No. 1,118,045; Nov. 24, 1914.)

STAMP MILLING—Ore-Feeder for Stamp-Mills and the Like. Edward Henry Moyle, Los Angeles, Calif. (U. S. No. 1,124,503; Jan. 12, 1915.)

STAMP MILLS—Mortar for Stamp Mills. Edward Henry Moyle, Los Angeles, Calif. (U. S. Nos. 1,121,117 and 1,121,118; Dec. 15, 1914.)

STEEL—Improvements in or Relating to Converters for Use in Steel Making. R. Hyde and J. R. Hyde, Sheffield, Eng. (Brit. No. 16,653 of 1913.)

STEEL—Machine for Hardening Steel. Gottlieb Wuelser, Columbus, Ohio. (U. S. No. 1,118,723; Nov. 24, 1914.)

STEEL—Manufacture of Steel. William R. Walker, New York, N. Y. (U. S. No. 13,861, reissue; Jan. 5, 1915.)

STEEL—Manufacture of Steel Articles. Henry M. Howe, Bedford Station, N. Y., assignor to Taylor-Wharton Iron & Steel Co., High Bridge, N. J. (U. S. No. 1,123,193; Dec. 29, 1914.)

STEEL CASTINGS—Method of Making Sound Steel Castings. Lewis B. Lindemuth, Steelton, Penn. (U. S. No. 1,116,-899; Nov. 10, 1914.)

TIN—Process of Making Pure Oxide of Tin. Gustav Spitz, Brünn, Austria-Hungary, assignor to Goldschmidt Detinning Co., New York, N. Y. (U. S. 1,119,547; Dec. 1, 1914.)

TINNING OR GALVANIZING MACHINES, Feed Mechanism for. Llewellyn Jones, New Castle, Penn., assignor to American Sheet & Tin Plate Co., Pittsburgh, Penn. (U. S. No. 1,117,578; Nov. 17, 1914.)

TUBE MILL. Charles F. Spaulding, Denver, Colo., assignor, by mesne assignments, to Allis-Chalmers Manufacturing Co. (U. S. No. 1,120,343; Dec. 8, 1914.)

WELDING—Method of and Apparatus for Electric Welding. Edwin I. Heinsohn, Cleveland, Ohio. (U. S. No. 1,119,079; Dec. 1, 1914.)

WELDING—Oxyacetylene Welding Torch. Prior F. Willis, St. Louis, Mo. (U. S. No. 1,119,916; Dec. 8, 1914.)

ZINC BLENDE—Dry Treatment of Ores. Wilhelm Buddeus, Charlottenburg, Germany. (U. S. No. 1,121,226; Dec. 15, 1914.)

Editorial Correspondence

SAN FRANCISCO—Jan. 13

Oil Pipe Lines operated by the five largest petroleum carriers in the state have been declared by the state railroad commission to be common carriers and public utilities subject to the provisions of the public-utilities act. These companies are the Standard Oil Co., Associated Oil Co., Producers' Transportation Co., Associated Pipeline Co. and General Pipeline Co. of California. They control 95% of the production of California.

Protection of Oil Lands menaced by water is contemplated by F. McN. Hamilton, state mineralogist, in a bill which has been submitted to the public for criticism or suggestion before introduction in the present legislature. A public meeting will be held at the state capitol, Jan. 15, for discussion of the subject. The Mining Bureau has issued advance chapters upon this subject, taken from the oil bulletin which is practically ready for publication. In investigation of the petroleum industry, Mr. McLaughlin, in charge of that department of the bureau, has given a great deal of time to the study of the subject of water infiltration and to discussion of remedies.

Riparian Owners' rights to the waters of Wolf Creek flowing in Nevada and Yuba Counties have been decided by the superior court of Yuba County in an action brought by the E. Clemens Horst Co., hop growers in the Wheatland region, against the New Blue Point Mining Co. operating at Smartsville. Other complainants brought similar suits. Judge McDaniels ruled that the water for power purposes brought from South Yuba River and allowed to escape into Wolf Creek is lawfully appropriated by the mining company at the intake of its ditch, together with the major portion of the water in the stream, and that it may be carried out of the Wolf Creek watershed, as it is not a part of the natural flow of the stream.

DENVER—Jan. 14

Resignations of about 25 salaried office men of the Colorado Fuel & Iron Co., at Pueblo, were required on Jan. 2. No public explanation has been vouchsafed for this action but it is assumed to have some connection with the payroll padding discovered last spring.

The Cresson find had scarcely become generally known when there appeared the ubiquitous counterclaim for ownership. Whether the claim of H. W. Keiser and wife, of Denver, is valid or based upon bluff, remains to be determined, but these persons state that in 1913 they grubstaked a prospector and became partners with him in the location of a fractional area contiguous to the Cresson claims. This ground was filed upon and surveyed for patent during the early days of the district but was permitted to revert to public domain by failure of the original owners to proceed with patent proceedings. Upon statements of Edward P. Arthur, Jr., mining surveyor, of Cripple Creek, these new claimants say that the bonanza is within the Jewell location. Possession of a deposit like this, worth millions of dollars, will be fought for and any legal proceedings will be followed with interest. The Cresson management declares the affair is pure blackmail and that their strike is well within their property lines. If the principle of apex rights be applied in this instance, the plaintiffs have provided themselves a nice task in discovering the outcrop of this pocket's vein and in tracing it, by sinking, the 1900 ft. to the chamber in question.

BUTTE—Jan. 14

Washoe Output during 1914, according to latest reports, was approximately 225,000,000 lb. of copper as against 272,000,000 lb. in 1913. Predictions are rife that with the perfection of the leaching and oil-flotation processes, blast furnaces will disappear and that the future will witness a smokeless reduction of copper and other ores.

SALT LAKE CITY—Jan. 14

Phosphate deposit locations made in good faith under the placer laws are validated by a bill recently passed by Congress. This will enable the Department of the Interior to issue patent on phosphate claims in northern Utah and southern Idaho entered as placer. Subsequent to entry these were held eligible only under the lode laws. Before Dec., 1912, when the Department decided that phosphate entries could be made only under lode laws, many entries were made in good faith as placer or association placer claims, and these will be validated if the necessary assessment work has been performed.

SEATTLE—Jan. 13

The Broad Pass section of Alaska which is attracting so much attention at this time is not a new field. In fact, the property which Wells Bros. sold to the Guggenheims, through Thomas Aitken, was discovered at least eight years ago and some work done on it. The locators were Curley Hickman and a partner, the former now being a resident of Cordova. They were in the Broad Pass country and located the claims in 1906, and after doing the assessment work abandoned them because of their remoteness from transportation. Later the claims were relocated by Wells Bros. and with the prospect of transportation the claims have acquired considerable value. Notwithstanding there have been some adverse reports coming out from that section, the Broad Pass country is attracting attention in all parts of the North and of the Pacific Coast from prospectors and investors. At Knik there are known to be over 200 persons waiting for conditions favorable for travel so that they may go to look over the ground with a view to investing in some of the properties already located. Many are waiting at Valdez to start for the district and several parties have already left from the Fairbanks end. So far no high-grade finds have been reported, the claims located covering immense ledges of low-grade ore. Most of these ores are base, but with transportation at a reasonable cost, which it is thought the Government railroad will supply, these properties can be operated, it is claimed, on a large scale at extremely low cost. The report is given general belief that the railroad commission in making its report on the route for the proposed Government road in Alaska had already determined by an investigation of the Broad Pass country that a road tapping that district and the coal fields would pay for itself in a short time on account of the coal and ore that would be handled.

SPOKANE—Jan. 13

Inland Empire mining companies paid $7,493,171 to their stockholders in 1914, as given by their official statements, or $987,017 in excess of the disbursements in 1913, the best previous record, according to a compilation by James A. Duff, mining editor of the "Spokane Spokesman-Review." The most remarkable feature is the great increase in net profits of the Hercules, which, according to one owner, reached a little more than $3,000,000 for the year. This property eclipsed all previous records and takes first rank among mines of the Northwest. The next record is that of the Stewart, which made an increase of $371,541 in disbursements over the previous year. Bunker Hill & Sullivan also showed a material increase, having disbursed 25c. per share each month to its stockholders, or $3 for the year. Canadian Consolidated showed a gain of $3664. These are the only companies to pay more than in 1913, and the others, with the exception of Caledonia and Kendall which were not among the operating properties in that year, paid less. British Columbia Copper, Knob Hill, Le Roi No. 2, Snowstorm and Success mines which paid in 1913, disbursed nothing in 1914. Granby reduced its payments $451,061, Federal $120,00, Hecla $100,000, Hedley $20,000, International Coal & Coke $90,000, and Standard Silver-Lead $175,000. The reports show that the copper companies were the hardest hit, and this reflected with particular severity on the properties in British Columbia, even on the silver-lead mines, as nearly all the smelters were closed down for several months, necessitating suspension of mining operations also. Canadian Consolidated is the only exception. British Columbia mines paid $2,611,219 to their stockholders in 1913, but last year the disbursements amounted to but $1,752,866, and it is estimated that earnings, including both dividends and the amounts diverted to the surplus and sinking funds, did not exceed $3,000,000. Mines of the Cœur d'Alenes paid $5,740,305 in 1914, as against $3,894,935 in 1913. Most of the earnings were devoted to dividend payments and the best figures obtainable indicate that the entire profits will not exceed $8,000,000 for the Coeur d'Alenes and British Columbia together.

SILVER CITY—Jan. 14

The Mogollon telephone exchange has just been installed and put into service. There is much snow in the mountains and a hard spring is anticipated. Transportation conditions are better and fuel oil and supplies are now going in. Bullion shipments are slight. The Mogollon saw mill which has supplied most of mine and mill timbers for the last 25 years has been sold by Harry Herman to Frank Kelly. At the Ernestine a more modern laboratory is being erected and rumor has it a new shaft will soon be started. The company continues to operate despite the shortage of fuel oil in camp. E. A. Wayne has resigned as manager and the new manager has not been selected. Ex-Postmaster Frank Hitchcock, president of the company, is still on ground. The Socorro shipments from the Pacific mine during the month averaged $15 to $20 per ton. The company is blocking out ore in the Johnson mine. The Enterprise Mining Co. has closed down for lack of oil and supplies. The Oaks is pushing development work on the Eberle, McKinley and Admiral Dewey tunnels and the shaft on Johnson 7.

DULUTH—Jan. 16

The Suit of the State of Minnesota vs. the White Iron Lake Mining Co., et al, as to the ownership of iron ore under Longyear Lake on the Mesabi range, has reached a conclusion. The supreme court held that the state has no ownership, in a proprietary sense, of the ore removed from under the lake bed, but that it has a soverign right of control over the waters of the lake and can enjoin interference with the lake bed below low-water mark.

In The Niles Land Co. suit against the Oliver Iron Mining Co. and the Chemung Iron Co., Federal Judge W. F. Booth in Minneapolis has by his decision established a precedent as regards compulsory mining under the terms of leases. The Niles Land Co., fee owners, brought suit to cancel a lease held by the Chemung Co. and subleased to the Oliver, alleging that the defendant companies had refused to mine the property, although paying all royalties due and otherwise keeping lease agreements. The court decides that a lease does not necessarily contemplate actual mining operations at or within any stated period, and that the lessor's acceptance of annual minimum royalty payments acknowledges his acquiescence in the manner in which the lease terms are being complied with.

CHICAGO—Jan. 16

The Cuyuna range, as indicated by recent events, is to have an independent miner and shipper of ore within the next year or two, in the Hill Mines Co., which will begin operations about the first of March, at the Hillcrest mine in Sec. 9, T. 46, R. 29, Ironton, Minn. The orebody on this property was discovered by the C. M. Hill Lumber Co., of Saginaw, Mich., in the early days of exploration on the range, and though reported to be one of the best and cleanest orebodies in the district, the owners of the lease have preferred to allow it to remain idle until now. It is intended to develop it as an openpit, and at the commencement of operations the upper, sandy part of the overburden will be removed with hydraulic giants and centrifugal sand pumps. This method of stripping, as will be recalled, was used recently with considerable success at the Rowe mine at Riverton, also on the Cuyuna range. The same method has also been used, of course, for some time in the phosphate fields of Florida. The operation at the Hillcrest will eventually include a cleanup of the top of the ore with steam shovels, and the mining of the shallower ore in the same way. Wilbur Van Evera, Virginia, Minn., will have charge of the operations.

HOUGHTON—Jan. 16

Rock Tonnage from the copper mines of the Lake Superior district indicates a remarkable efficiency on the part of the underground forces of all the properties. The following figures are unofficial, but they are accurate averages of the daily tonnages from all of the mines of the district thus far during January: Baltic 1400, Trimountain 1300, Champion 2700, making a total of 5400 for Copper Range Consolidated; Victoria 300, Mohawk 2500, Allouez 1600, Isle Royale 2000, the Kearsarges and Old Osceola 3800, Wolverine 1700, Centennial 700, Mass Consolidated 900, Superior 700, Calumet & Hecla 8600, Quincy 4200. This gives a total daily average of 32,400. Assuming 14 lb. of refined copper to the ton the daily output of copper becomes 453,600 lb. The mines average 21 days' work a month.

IRON RIVER—Jan. 16

A Better Feeling now prevails in the Iron River district since orders were received by the management of the Munro Iron Mining Co. to resume operations on Feb. 1. The company, which is a subsidiary of the Rogers-Brown Ore Co., owns the Rogers, Chicagon and Hiawatha mines. The Rogers and Chicagon stopped mining in the fall, while the shaft at the Hiawatha had not been bottomed when work there ceased at the same time. This work will be taken up where it was left off when the shut-down notice arrived. General Manager G. L. Woodworth states that many of the old hands are still in Iron River and their places will be held open for them until the first of the month. Employment will be given to several hundred men. Most of the ore which the Munro company mines goes to the Rogers-Brown furnaces in the East. It is reported that several other mines in the Iron River field are to be reopened at an early date but the managements have given out nothing definite as yet. The Reserve Mining Co., which has operated its Buckeye mine only five days a week for several months past, is now working full time and the force has been increased. The company has not received orders for ore for 1915 delivery but believes that the inquiries will soon be coming in and desires to be prepared to take care of them.

PULASKI, VA.—Jan. 16

Iron and Zinc deposits in the New River-Cripple Creek section are receiving attention again and there is a prospect of an important revival in that historic mining region soon. Recently zinc ore has been found in connection with the iron mines of the Ivanhoe Furnace Co., at Ivanhoe, and experiments with the S. L. Boggs washing process to concentrate the iron and zinc ores are being made. It is assumed that the furnace, which is controlled by Pittsburgh interests, is planning to resume operations. The deposit of zinc-sulphide ore at Allisonia, owned by Messrs. Forney and Caldwell, is being developed and it is reported that the ore which is exposed in the bed of New River has been found to extend to both sides of the river in interesting amounts. The ore is a finely intercrystallized mixture of iron and zinc sulphides replacing limestone and its economic treatment is considered difficult by any of the usual methods. Experiments with electrostatic treatment and with oil flotation are being made. An old mine on the south side of the river here was extensively worked for lead during the war. It is apparently an extension of the same formation now being explored in the river bed and north of the river. The same people have developed an important deposit of iron ore adjoining the old R. D. Woods iron mine about a mile north of the river at Allisonia.

TORONTO—Jan. 16

Total Dividends and bonuses paid by mining companies in Cobalt and Porcupine during 1914 amounted to $8,049,810, while the dividends paid since the inception of these two camps are $60,365,285 to date. The disbursements for 1914 are about $1,000,000 less than for the preceding year. The largest single contributor is Nipissing which has paid $12,240,000 to date. Of dividends for the year the Porcupine district contributed $1,250,000 from the Hollinger and Porcupine Crown; the balance came from Cobalt. During the year Buffalo, Coniagas, Crown Reserve, Cobalt Townsite, La Rose, Nipissing, Hudson Bay and Trethewey paid decreased dividends while Cobalt Lake, Caribou Cobalt, and Seneca Superior paid increased dividends.

The Nickel Agitation has quieted down since the last statement on the subject was made by the Canadian government, the public being generally disposed to accept the view that if the steps already taken are regarded as satisfactory by the British government there is no need for further action to prevent nickel shipments from reaching Germany. The propaganda is still being continued by a few sensational and ultra-protectionist journals, but with little success, since no important public body has taken up the question. At a recent meeting of the Sudbury Board of Trade resolutions were adopted in favor of refining nickel in Canada "if the same is economically practicable and can be done without injury to Canadian trade," but at the same time the Board declared that there was no reason for believing that the product of Canadian nickel-matte was reaching Germany via the United States since the beginning of the war, and placed itself on record against an export duty without first making a thorough investigation "as this Board of Trade and this community do not wish large industries, such as the Canadian Copper Co. and the Mond Nickel Co., jeopardized by misguided patriotism or rival interests.

Hollinger stock has experienced a rapid rise during the past few weeks. This has been interpreted as an indication that the dividend rate would be increased and this increase was authorized at a meeting of the directors which was held in Toronto, Jan. 14. The previous rate was 3% and the new rate will be 4% for each 28-day period, making a total of 52% a year. This new rate will call for the distribution of $120,000 for each period, but with the new milling equipment rapidly nearing completion, the mine should have no difficulty

in earning the dividend. The new power station, which is being erected by the Canadian Mines & Finance Co., will have its capacity still further increased. One Fraser & Chalmers, and two Nordberg machines are already installed, and in operation, while another Nordberg machine is being erected. Each of these compressors has a capacity of 5000 cu.ft. of free air per min., and the new plant will be used as a central distributing station for the Hollinger, Acme, and Miller-Middleton which are all controlled by the Canadian Mines and Finance Co. It is thought in some quarters that these three properties will eventually be merged, and as the development work on the Acme and Miller-Middleton progresses, the capacity of the Hollinger mill will be gradually enlarged until a total crushing capacity of 3000 tons a day is reached.

The North Bay discovery of a precious-metal and radium deposit on the basis of which application was recently made for the Ontario government bounty of $25,000 offered for the discovery of commercial bodies of radium ores, exhibits curious features. A Buffalo chemist who received some of the ore gave a return of 6% molybdenum, 25% graphite, 17% copper, 56 dwt. of platinum, 43 dwt. of gold, 104 oz. of silver and small amounts of zinc and nickel. In addition it was stated that the ore was highly radioactive. It appears, however, that when the chemist went to North Bay to interview the owners of the claims, he was more anxious to sell stock in an electric furnace which he was promoting, than he was to treat any of the ore. One assay of $4.60 in platinum has been reported by a reliable assayer, but the majority of the samples, some of which were sent to Ledoux, showed no platinum, about 20c. in gold and small amounts of silver.

EL PASO—Jan. 14

At Santa Eulalia, Chihuahua, the San Toy, the Chihuahua Mining Co., the Potosi Mining Co. and the Buena Tierra are operating with full forces, and the output of the camp is probably about 75% of normal. The Guggenheim properties there are not operating at present, and so far as known they will not resume for some time. There are several smaller properties doing some work, but the four mentioned are the most important.

Among Outside Mines the Dolores is practically closed, since the district is too far from the railroad for supplies to be delivered regularly, and only a few men are being kept at work. The Republica, one of the heavy producers before the revolution, has been closed for many months, as it also is too far from any base of supplies for present operation. The Yoquivo is being operated with about normal force, producing the usual quota of gold-silver bullion. The Virginia is operating a high-grade copper mine in the vicinity of Yoquivo and is shipping copper ore to Terrazas. At Batopilas, mines are operating and both mills are running, notwithstanding that they are farther from the railroad than any of those just mentioned.

At Parral, the Alvarado Mining Co. is operating at full capacity, and is turning out both bullion and concentrates. This company has had some trouble in keeping a supply of cyanide on hand for the 500-ton mill, and there has been some delay on account of fuel, but little time was lost during the year. Practically all the other large properties in Parral are temporarily closed.

At Santa Barbara, the Tecolotes mine is being pumped out, and active operations will be resumed in a short time. It was reported some time ago that the 1000-ton mill of this company had been seriously damaged by fire, but the damage proved to be comparatively light. At present, only the zinc plant in which the zinc concentrates are magnetically treated is being operated. Some little development work is being done on the Cabrestante mine in Santa Barbara, and the other larger properties are closed. El Rayo, located about 15 miles southwest of Santa Barbara, is operating with full force, and preparations are being made to increase the tonnage of the mill and cyanide plant to 300 tons per day.

The Terrazas smelting plant is closed at present, but is receiving some ores, and will probably resume in a short time. It is reported that the government has taken hold of the plant at Santa Rosalia and is preparing to operate it on ores from the many confiscated properties in the state.

GUADALAJARA—Jan. 2

Irritation exists here over the way Mexican news is garbled or actually "faked" in the United States newspapers. In the New York "Tribune" of Nov. 30, one can see the statement: "One thousand men in killed and wounded and 20 cannon captured by the enemy is the cost to Villa's army of the latest attempt by Gen. Felipe Angeles to wrest Guadalajara from Carranza control." As a matter of fact there was no fighting between the Carranza and Villa factions in or near the city of Guadalajara and not a shot fired near enough to be heard there. On the approach of the Villa forces the Carranza element left hurriedly in the direction of the Pacific Coast, and the city was abandoned completely by the Carrancistas two days before Villa and his troops arrived, being policed meanwhile by a special guard hired by the business and better social elements. Reports to the State Department are understood to have been equally misleading.

TORREON—Dec. 21

The Situation Is Still Mixed down here. It would appear that in view of Villa's personality and the way things are turning out he made a mistake in letting the convention deliberate so long. He rather swapped horses in crossing a stream; that is, dropped his fighting policy, his scheme of hewing his way through to the City and issuing his terms there, for a policy of conciliating, placating, and uniting all factions in his favor or in favor of the convention. This has introduced new elements and new factors into the scheme, many of them not so sympathetic with him as they might be, and this is bound to result in complications. If he had fought his way right down the line, as he was fully prepared and equipped to do, there is no doubt that he would be really stronger than he is today. Events prove that the Carranza forces were absolutely unable to resist his advance, and in spite of the newspaper talk, there was not a single combat between Aguas and Mexico, since the Carranza forces would not face Villa. There was a little fighting at Pachuca, and none in Guadalajara. Now Villa has united with him in the government a lot of people from the West Coast, together with the Zapatistas and others, and unless the character of these men has changed it is hard to see how everyone is going to pull together in harmony. While it looks all right on the surface, and many people are figuring that although Zapata will buck sooner or later, Villa is strong enough to eliminate him, the fact remains that in such elimination the other inharmonious elements are likely to bob up again. Villa is in the position of a man who starts up a prospect, sees it grow into a mine, and then into a much larger proposition, where it demands many aids in the shape of superintendents and foremen. He handles it all right up to a certain point, where his knowledge of details and his personality dominate. When the work expands, however, and he has to trust his aids to handle the different departments without personal supervision, the test comes. So now the question of intervention and nonintervention would appear to depend upon the way in which Villa handles the country when his convention dominates it entirely; and it is certainly true that foreigners are not a bit optimistic; although they are glad to see the Carrancistas go, as are a large part of the Mexicans, they are doubtful whether peace and harmony are going to reign after the election. There are too many men making money out of the trouble to allow the trouble to stop short, unless other means of getting money are substituted, and if the people with property are pressed too hard, trouble is bound to come sooner or later. Everyone is hoping that they will get together and that peace will come; but if Villa is not the man to handle it, if he cannot hold the different factions together, irrespective of who is elected president, then everyone is in for it again some day and one not far distant either. It is surprising how many Mexicans have come around to the conclusion that intervention is the only way of bringing peace.

LA LIBERTAD, CHONTALES, NICARAGUA—Dec. 15

The Babilonia Mines, Ltd., one of the largest operators of the district, has been forced to stop construction work on the new mill, due to the financial stringency following the war. The new slime plant, which began operations last June, was running on the slime bank from the old mill. There is about a year's supply of this material on hand, averaging $10 per ton. The drainage tunnel to the shaft is practically completed and the cornish pumps are being placed in position. The new gas engines operating on producer gas made from charcoal have been a great success, giving ample power with little attention and few repairs. Construction work on the new cyanide plant for the Javali mine is under way. Part of the machinery is on the ground and the rest will arrive soon. This mill will have a capacity of 150 tons. The grinding is to be done with Holman pneumatic stamps followed by a Hardinge mill. The sands will be leached and the slimes agitated by Dorr agitators. The continuous decantation process will be used to separate the slime from the pregnant solution. The Esmeralda mine is still running but at a reduced capacity while the San Juan has been forced to shut down. Supplies are difficult to secure at present, especially cyanide. A Wilfley table has been installed at the Escandalo mine and is giving good results. Another will be put up at the Cedro. The great drawback to concentration is the high price of freight, $76 per ton, to the American smelters.

The Mining News

ALABAMA

GULF STATES STEEL CO. (Gadsden)—Rolling mill put in operation. Large orders for wire and nails reported.

OLD SPENCER dolomite quarry at Boyles being put in shape for production. Product said to be best quality of flux in district. Walter Moore and associates interested.

VALLEY VIEW NO. 2 (Birmingham)—This mine, also known as the Frank White lease, has begun shipping iron ore to Sloss-Sheffield Steel & Iron furnaces. Gordon Robinson operating mine.

ALASKA

GRANITE GOLD (Valdez) — Contract said to be closed with Hunt, Mirk Co., of Seattle, for entire power plant equipment and transmission line.

MOTHER LODE COPPER (Shushanna Junction)—Ore reported struck in north drift and in raise, both new bodies. Shipped 250 tons to Cordova, Jan. 15.

ALASKA GOLD (Juneau)—Special stockholders' meeting called for Jan. 21, in Portland, Me., to authorize issuing $1,500,000 of 6%, 10-yr. debentures, convertible at $30, and to authorize issuing 250,000 $10 shares to take care of debentures or to be used as required. Money needed to proceed with enlargement of milling plant. Stockholders have right to subscribe to $2 worth of debentures for each share of stock.

ARIZONA

Mohave County

TOM REED (Oatman)—A 150-hp. hoist installed for sinking to 1050-ft. level soon. Depth of 950 ft. reached in winze from 750-ft. level.

CALIFORNIA

Amador County

SOUTH JACKSON (Jackson)—Mine closed down first of year. Date of resumption indefinite.

Calaveras County

UNITED MILLING & MINING CO. (Angels Camp)—Bond taken on Brunner mine, together with adjoining properties. Expected to undertake extensive development.

Kern County

GOLD PAN DISTRICT name given to new mining section near Amalie district, but said to be entirely separate. Some recent discoveries made indicate possibilities of developing producing mines. One of these is Mystery No. 4. Development contemplates running three levels and if results warrant, five-stamp mill will be installed. Wasco is nearest post office.

GREENBACK (Woody)—Weringer Mines Co. organized with $500,000 capital stock to operate this copper property. Ore has been shipped from McFarland, but when county highway is completed shipments will be from Oil Center. The two shafts are to be connected by crosscut at 200-ft. level.

BALD EAGLE (Bakersfield)—This property in White River district, leased to Miles R. Martin. There are six claims in group; fine showing of free-milling ore reported. Property equipped with five-stamp mill.

Mariposa County

MOUNTAIN KING (Bagby)—New power house with capacity of 500 hp. being installed. Installation of new 60-stamp mill also begun. Old mill consisted of 20 stamps. Large body of good ore recently reported. Fifty men employed.

RUTH PIERCE (Hornitos)—Mine, former producer, taken over by stock company and mill will be put in commission to treat ore on dumps while development underground is in progress. William Shearer, of Jamestown, manager.

Nevada County

ORLEANS (Grass Valley)—This one of Sultana group to be reopened and developed by 1000-ft. shaft. Small number of men now employed will be increased as work progresses.

COLLING (Rough and Ready)—Mine reopened after being closed for two years. Three small veins crossing main ledge show good ore. Development includes three-compartment shaft 132 ft. deep.

EL ORO (Lake City)—Development in progress by means of two-compartment shaft and Keystone drills. Shaft will be equipped with power hoist. Believed gravel channel will be encountered at depth of 200 ft. Ground yielded large returns to hydraulic miners in early days.

EMPIRE (Grass Valley)—New 20-stamp mill in commission and crushing 80 tons of ore in 24 hr. Stamps weigh 1370 lb. Special amalgamating device proving successful. Old 40-stamp mill will be rebuilt with heavier stamps and other improved metallurgical equipment. Large reserves of milling ore blocked out on 3600-ft. and some upper levels.

Plumas County

DEAN (Seneca)—Property bonded to J. D. Wilson and contract let to drive 200-ft. tunnel to tap quartz ledge.

SENECA CONSOLIDATED (Seneca)—New air compressor being installed. Mill crushing ore for two months. Long tunnel will be driven to tap Del Monte ledge. Forty men employed.

LITTLE JAMISON MINING CO. (Johnsville)—First dividend in several years declared at end of December: Development until recently absorbed all funds. Mine reported now in good condition for renewed production.

Shasta County

DREDGING ground recently located and filed upon near Gas Point and Igo for purpose of prospecting with view to installing dredge. There are 1160 acres in claims. Locators San Francisco men.

SHASTA BELMONT (Heroult)—Owners purpose resuming operations in February. Mine was closed down indefinitely on account of war. Ore carries copper and silver.

GLADSTONE (French Gulch)—Vein cut on 1200-ft. level at 125 ft. below working level, 2000 ft. vertical depth below outcrop. This persistence expected, but by no means positive, when new hoist was installed with a view of deeper sinking. I. O. Jillson managing owner.

Tuolumne County

EMERSON RANCH (Stent)—Hoist and five-stamp mill being installed on property recently developed.

ADVANCE GOLD MINING CO. (Jamestown)—This gravel mine at Peoria Flat, being developed with steam shovel, has recently been working in good pay gravel.

PEORIA FLAT (Jamestown)—Steam shovel used to cut sluiceways and open up heavy gravel and prepare ground for tram tracks and other equipment. Fenner mill being installed.

GOLD RIDGE (Sonora)—Bond held by Henry T. Gage, of Los Angeles, extended under favorable conditions. Property will be thoroughly explored and if development warrants mill will be installed.

Yuba County

GUGGENHEIM interests have made final payments on large acreage of dredging ground extending north of Yuba Consolidated Gold Fields grounds to Parks Bar along Yuba River.

COLORADO

Clear Creek County

JACKSON MILL (Idaho Springs)—Beginning Jan. 1 this amalgamating and concentrating mill increased operating time from two 8-hr. shifts to three. Ore supply coming from Big Five, Saratoga and Golden Edge properties. Paul Roberts manager.

ENGINEERS LEASING CO. (Idaho Springs) — Company operating on Dyke vein through Newhouse Tunnel has sunk winze 40 ft. and will continue to depth of 100 ft. below tunnel level. Hoisting station and ore bin cut, pump will soon be installed. Company has also secured lease on Concrete property which will be operated through tunnel.

ISABELLA (Altman)—Number of lessees increased from 30 to 40 and about 25 of these shipping ore. Numerous improvements made in surface equipment, including new sill timbers and headframe at Lee shaft, new ore bin, additional railroad siding, reroofing and repainting several buildings. Leyner sharpener added to the blacksmith equipment. Railroad siding built to ore house at Empire State shaft. Several old underground workings caved in, reopened and repaired; 40 new mine cars added to underground equipment. Some underground development being done on company account but bulk of such work performed by lessees.

IDAHO

TUSCUMBIA (Sunset)—Leased to G. Ehrenberg and associates. Raise completed in November from No. 3 tunnel to No. 4 tunnel, blocked out ore which will be mined as soon as mill can be provided.

AMERICAN PLACER (Pierce City)—Company erecting dredge to begin operation Mar. 1, on Orofino River 7 miles below Pierce. Daily capacity 2500 cu.yd.; 3½-cu.ft. buckets; steam driven. J. M. Porter, chief owner, supervising work. Part of deposit formerly worked by hydraulicking using elevator.

STEWART (Kellogg)—Company has taken option and bond on three-fourths of stock of Slavonion Mining Co., and on property of Keating Mining Co., both at Wardner. Development work must be commenced before Mar. 1 and continued during life of bond. First payment due Jan. 1, 1916. Present crosscut tunnel on Slavonion will be continued to vein, about 300 ft. beyond present face. Keating mine now developed through shaft 250 ft. deep.

ONTARIO vs. STEWART—Case occupied week in district court. Plaintiff now claims $70,000 worth of ore taken from Ontario claim. Defendant contends boundary of Ontario as held by plaintiff is not true boundary between them, but that southwest corner of Switchback claim establishes boundary. Has been proved that part of trespass has been committed since Aug. 31, date of injunction issued by court, restraining Stewart from mining within disputed area.

MICHIGAN

Copper

COPPER RANGE reported as resuming full production.

WINONA (Winona)—Shipping 200 tons of rock daily to Trimountain stamp mill; transferred from Calumet & Hecla subsidiary, saving freight charges.

CALUMET & HECLA—(Calumet)—Total rock shipments averaging 150,000 tons monthly, compared with 250,000 tons normal. No intention of resuming normal shipments until European war ends.

ISLE ROYALE—(Houghton)—Over half debris from

wreck of stamp mill cleared away and rock removed from bins. Reconstruction will be rushed and mill rebuilt by July. Government engineer says sand pile is still 400 ft. from harbor line. Turbine engines will furnish power in new mill.

OSCEOLA CONSOLIDATED (Osceola)—Total rock shipments again normal and copper output up to restricted basis established at beginning of war, following curtailment from Dec. 18 to Jan. 6. Destruction of boiler plant at No. 3 shaft, North Kearsarge branch, put that plant out of commission. Efforts directed toward establishing No 1 North Kearsarge as shipper and miners from No. 3 started work there. This plant has undergone thorough remodeling, can now hoist and handle larger tonnage than ever before. Not yet decided as to reconstruction of No. 3 boiler plant. Possibility of erection of plant midway between Nos. 1 and 3, to supply both shafts. January 6 saw beginning of heavy rock shipments from No. 1. Osceola tonnage now 4000 daily.

LAKE AND SOUTH LAKE—(Houghton)—Consolidation may take place. Lake has fully equipped shaft pointing to South Lake, which carries western extension of the lode worked by Lake. South Lake also carries two other lodes near it, neither of which developed commercial copper on Lake. On South Lake these lodes were developed by six diamond-drill holes, two of them close to boundary. Other four extended over 1300 ft. west of center of South Lake. All carried copper. W. R. Wallace, diamond-drill contractor, pronounces one of these cores richest ever taken from Lake Superior drill hole. These lodes now being further developed by crosscut from 600-ft. level of South Lake shaft which is 1400 ft. north from drill holes. Crosscut has just reached and passed through first lode. It showed copper for 11 ft.; 5½ ft. next to hanging exceedingly rich; 200 lb. small masses taken from 7x7-ft. crosscut. This showing met expectations of drill results. Exploratory South Lake work has bearing on future of Lake, as the Lake lode was turning decidedly to west when development ceased, and it would be practicable to develop and mine this South Lake rock from Lake shaft. Under circumstances talk of consolidation is based on mutual advantages. Will become more pronounced when South Lake crosscut further opens lodes it is tapping. South Lake developing lode cut in shaft 110 ft. down from crosscut on the 300-ft. level; drift 400 ft. long has fair commercial ground from end to end. This lode 20 ft. wide. Two other lodes show in shaft and crosscut but not so good as drift showing.

MINNESOTA

Cuyuna Range

CROFT (Crosby)—Sinking of concrete drop shaft somewhat delayed owing to shaft's getting out of line.

BRAINERD-CUYUNA (Brainerd) — Third shaft has just reached ledge. Two previous shafts were lost on account of quicksand and water.

WILCOX (Woodrow)—Large Cameron electric pump will be installed on 200-ft. level at once. Headframe practically complete. Underground work concentrated on crosscut through orebody to south wall. New changehouse equipped with hanging lockers just completed.

BRAINERD MINING CO. (Barrows) — Company operating drills on Barrows mine property. Hole 43 recently indicated considerable tonnage of 63% ore with low silica content. Presence of large percentages of silica has heretofore militated greatly against value of South range ores, and this discovery has renewed interest in district.

Mesabi Range

RUDDY (Biwabik)—Mine resumed operations, employing 50 men.

MONTANA

Madison County

FLORIDA-GIANT (Twin Bridges)—At properties of company in Bear Gulch, another vein of gold ore encountered which promises to increase greatly value of property. Runs parallel with vein now being exploited and appears to be main vein in region. Work to develop will be pushed.

Silver Bow County

RAINBOW LODE DEVELOPMENT CO. (Butte)—Payments for mineral claims under bond being completed. Directors have not decided when exploration work will be resumed.

NORTH BUTTE (Butte)—Before leaving Butte Thomas Cole stated development work would be carried on, to employ married men and to open up orebodies for economical extraction later.

MOUNTAIN VIEW (Butte)—Interesting engineering feat just accomplished. Mine has been down since last July. In retimbering shaft, bringing it up vertically from below, collar came so that old position of headframe was no longer true. Had to be made plumb with shaft before it was practicable to continue operations. Ground around collar had settled 2 to 3 ft. in various directions. Steel headframe weighing 120 tons and 108 ft. high, was supported on massive timbers and then moved with jacks. Later, men put cement foundations around frame and shaft collar. New structure in course of erection to house hoisting engine which will also have to be aligned with new shaft collar and sheaves.

NEVADA

Esmeralda County

SPEARHEAD GOLD MINING CO. (Goldfield)—Lease taken on south 850 ft. of Rosebush claim; to run 2½ years with extension of six months more. Company formed called Spearhead Extension Mining Co., and capitalized for 1,000,000 shares, par value $1. Work will begin at once and two-compartment shaft will be sunk 300 ft.

JUMBO EXTENSION (Goldfield)—Report for November: Tons produced, 1599; gross value, $124,900; net profit, $93,375. Headframe being removed from Original Velvet lease shaft preparatory to installing larger headframe, 75-hp. hoist, and eight-drill compressor. Shaft, now 400 ft. deep, will be enlarged from two compartments to three, and sunk to 1017-ft level. Connections will be made with 700, 865-, 921- and 1017-ft. levels of Polverde shaft, present main working shaft.

Humboldt County

NO POTASH in Black Rock Desert according to statement of M. I. Goodwin, U. S. Geological Survey. Well sunk 1500 ft. Possibility of extracting niter from soil under discussion.

Lyon County

MASON VALLEY MINES CO. (Thompson)—Demurrer to complaint of Pacific Livestock Co. sustained in district court. Pacific sought to obtain temporary restraining order against future operations at smelting plant on grounds that damage would result.

Mineral County

ROGERS & LALLY (Aurora)—Ten-stamp mill nearly completed; expected to be in operation in February.

Nye County

BIG PINE (Manhattan)—New mill proving superior to expectations. Tube mill handles 250 tons per day. Waste stocker eliminates several carmen. Trommel will take place of grizzlies.

WHITE CAPS (Manhattan)—Reported Tonopah Mining will sample, preliminary to taking short-time option. If preliminary development is satisfactory will then form new company for 60% interest and finance thorough development and treatment-process experimentation.

BIG FOUR MINING CO. (Manhattan)—Supreme court of Nevada decided in favor of plaintiff in suit of John Ryan for damages. Ryan fell from bucket while being hoisted after having spit round of holes. No safety ladder was provided in shaft and no iron-bonneted safety cage, as required by law. Award of $2500 made plaintiff.

NEW MEXICO

Lincoln County

WILD CAT LEASING CO. (White Oaks)—Company has filed incorporation papers for $210,000 to construct power transmission line from Homestake mines to Carrizozo. A. A. Lane, E. L. Queen and D. L. Jackson incorporators.

UTAH

Juab County

BULLION BECK (Eureka)—Hoist overhauled and in running order. Operations by lessees resumed. Eureka Mill also worked again by lessees through Bullion Beck.

Salt Lake County

UTAH METAL & TUNNEL CO. (Bingham)—This company, formerly Utah Metal Mining, drifting on some prominent mineralized fissures opened by its tunnel between Bingham and Tooele. Company in good financial condition to carry on work.

ALTA TUNNEL & TRANSPORTATION (Salt Lake)—Tunnel being driven toward Alta from Big Cottonwood side in 992 ft. Progress of 5 ft. daily being made. Face in white limestone; mineralization shown in places from 850-ft. point.

WISCONSIN

CHAS. KISTLER at Platteville has completed two-jig mill on Alderson tract.

C. C. MATHEY, of Galena, has assembled 50-ton mill on Dinsdale property, formerly operated by Appleton-Galena Co.

CANADA

Ontario

ALEXO (Porcupine)—Mine in December shipped 878 tons high-grade nickel ore to Coniston.

HURONIA (Larder Lake)—Mine shipped $3000 in gold bullion, as result of two weeks' cleanup.

ACME (Timmins)—In drifting on one of veins on the 200-ft. level short shoot of ore encountered that assayed $700.

METEOR (Cobalt)—Power plant and blacksmith shop on this property, adjoining McKinley-Darragh, were destroyed by fire Jan. 15.

McINTYRE (Schumacher)—Company has started sinking main shaft from 500- to 600-ft. level. Company expects to maintain monthly output of between $60,000 and $70,000.

TEMISKAMING (Cobalt)—Spectacular oreshoot opened on 530-ft. level shows at present between 4 and 5 in. high-grade in drift, and good width of mill rock in addition. Vein was originally found on Beaver; being developed from Beaver workings. Find made in virgin territory.

MINING CORPORATION of CANADA (Cobalt)—This company, which controls Cobalt Townsite, City of Cobalt, Townsite Extension, and Cobalt Lake mines, has decided to bring all its properties under one management. Charles E. Watson will be placed in charge.

WETTLAUFER (South Lorrain)—Annual report shows credit balance of $29,680 and sundry investments of $109,912. Profits for year $5163. Property was not worked during the year. Large number of properties examined with view to purchase, but report states majority were worthless and those of interest were valued too high.

HOLLINGER (Timmins)—Company during 1914 distributed $12,000 bonus for loyal service. System adopted in 1913 based on graduated scale. After first year bonus is 15c. a day, 30c. for third year of service and 45c. for fourth. Expected annual report will show reserves above 100-ft. level, equal in value to the whole of reserves for previous year. Development during year successful to extraordinary degree.

Quebec

BELL ASBESTOS MINES—(Thetford Mines) — Operations resumed after suspension of four months. Mines and mill will run day and night employing about 300 men.

The Market Report

Metal Markets

NEW YORK—Jan. 20

The copper market has exhibited further strength. Tin also has been stronger. In spelter there has been a sharp rise. Lead on the other hand has manifested a weaker tone.

Copper, Tin, Lead and Zinc

Copper—The strength noted in our last report continued, and under the influence of important buying, the market became firmly established on the basis of 13¾c., regular terms, on Jan. 14, while by Jan. 18 sales began to realize 13⅞c., and on Jan. 19, the market was fully on that basis. Talk about 14c. having been realized is misleading. If that price has been paid in any cases it has been for delivery to points whither freight and other charges are correspondingly high.

The leading interests in copper selling have, indeed, exhibited a very wise moderation. It is distinctly a sellers' market, but there is no disposition shown in any quarter to jack up the price arbitrarily.

The sales of the last week were rather large in volume. In fact, ever since Jan. 1 sales have been running far in excess of the current rate of production, which last week we estimated at 70 to 80 million pounds per month. Gossip about one very large sale to an unusual quarter appears to have some foundation in fact.

Copper sheets, base price was advanced ¼c. on Jan. 16 and is now 18¾c. for hot rolled and 19¾c. for cold rolled. Usual extras charged and higher prices for small quantities.

The Department of Commerce reports the exports of copper from the United States for the week ended Jan. 9, at 16,882,000 lb. The larger shipments were 7,896,000 lb. to France, 6,252,000 to Great Britain and 2,622,000 lb. to Italy. Imports for the same period were 635,000 lb. metal and 2,014,000 lb. in ore and matte; 2,649,000 lb. in all. Imports were from Cuba, Canada and Chile.

Visible stocks of copper abroad on Jan. 15 were reported as follows: Great Britain and France, 18,750; Rotterdam, 1150; afloat from Chile, 2500; afloat from Australia, 4400; total, 26,800 long tons, an increase of 875 tons over the Jan. 1 report.

By regulation effective Dec. 14, 1914, the Federal Council fixed the maximum price for copper in Germany at 200 marks per 100 kg., equal to 21.6c. per pound.

Brass Prices, base, are announced by the American Brass Co. as follows, to date, from Jan. 15: Sheets, high brass, 15½c. net per lb.; low brass, 17½c. Wire, high brass, 15¼c.; low brass, 17⅛c. Rods, high brass, 15¼c.; low brass, 17⅞c. Tubes, both brazed and open seam, 19¼c. Angles and channels, 19¼c. Scrap allowances are 10c. net per lb. for high brass; 11⅛c. for low brass.

Tin—The London market showed an advancing tendency throughout the week, and rules very firm. The domestic market moved in sympathy with that of London, quotations being marked up in proportion to the advance in London. No great interest was shown, however, by American consumers who viewed the strength abroad with a good deal of apathy.

Lead—Business was dull and again there was a weaker tone which is reflected fractionally in the quotations. Several sellers reported failure to consummate business although they made what they considered to be low offers, business being in fact taken by other sellers who went still lower. The sentiment in this trade is, however, mixed. Some sellers express themselves pessimistically, others are moderately optimistic, and others still say that they are all at sea.

Imports of lead for the 11 months ended Nov. 30 were 48,107,094 lb., against 108,636,616 lb. in 1913. Exports for the 11 months were 111,162,129 lb. domestic lead and 37,387,325 lb. foreign lead; 148,549,454 lb. in all. In 1913 there were 86,399,134 lb. foreign lead reëxported; no domestic lead was exported.

Spelter—This market was excited and it is hard to quote it accurately, there being differences of 10 points or more in prices realized in the same office from day to day, and similar differences among different offices. The advancing tendency was apparently foreseen by certain sellers who themselves were large buyers on the way up. Up to Monday the market was strong, but well in hand. On Monday Europe began to buy largely and prices advanced steadily, £29¾ being realized on export business on Monday, £29¾@31¼ on Tuesday, and £31@31¼ on Wednesday. Considerable domestic business was done during the week, but the export business predominated. Sales aggregated many thousands of tons.

Very unusual conditions prevail in the market for zinc dust. This material is selling at 11@12c. per lb. when put up in zinc-lined boxes holding 200 lb., which is the packing desired and bought by the cyanide mills. At present only American zinc dust is available in that packing. On the other hand, imported zinc dust, put up in 1500-lb. casks, is quoted at 7c. per lb. in bond, to which the duty of 15% has to be added. Some zinc dust thus put up is now coming through from Germany, but the arrivals are very irregular.

DAILY PRICES OF METALS IN NEW YORK

Jan.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
14	4.8363	49⅛	13.50 @13.60	33⅜	3.50 3.70	3.50 3.55	6.02½ @6.12½	5.85 @5.95
15	4.8369	49	13.55 @13.60	33½	3.67½ @3.70	3.47½ @3.52½	6.07½ @6.17½	5.90 @6.00
16	4.8388	48¾	13.55 @13.60	33¼	3.67½ @3.70	3.47½ @3.52½	6.07½ @3 17½	5.90 6.00
18	4.8400	49	13.65 @13.70	34	3.65 @3.70	3.47½ @3.52½	6.12½ @6.22½	5 95 @6.05
19	4.8400	49	13.65 @13.75	33¾	3.65 @3.70	3.47½ @3.52½	6.22½ @6.32½	6.05 @6.15
20	4.8375	49	13.65 @13.75	34¼	3.65 @3.70	3.47½ @3.52½	6.37½ @6.47½	6.20 @6.30

The quotations herein are our appraisal of the markets for copper, lead speltes and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producer, and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The difference between the price delivered and the New York cash equivalent is at present 0.15 to 0.20c. on domestic business and 0.25 to 0.37½c. on European. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are; St. Louis-New York, 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c

LONDON

Jan.	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
14	22⅞	59¾	12.98	59⅞	....	151½	146	18⅝	4.05	29½	6.41
15	22 13/16	60⅛	13.06	60¼	65¼	152	145½	18½	4.02	29¾	6.46
16	22⅞	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	22 13/16	60⅞	13.23	61	....	154½	147	18½	4 02	30	6 52
19	22 13/16	60¾	13.20	60⅞	66	54	147½	18½	4 02	30½	6.63
20	22 13/16	61	13.25	61⅛	....	155	148¼	18½	4 02	31¼	6.78

*No quotations.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26¼c; £20 = 4.35c.; £30 = 6.52c.; £60 = 13.05c. Variations, £1 = 0.21¾c.

Other Metals

Aluminum shows no material change, business remaining quiet and sales moderate. Current quotations are 18¾@19¼c. per lb. for No. 1 ingots, New York—**Antimony** has been in demand and there has been quite active buying, some of which is thought to be for export. Prices have advanced sharply, especially for ordinary brands which are selling now at 16@17c. per lb. For Cookson's 17@18c. per lb. is asked—**Nickel** is unchanged, ordinary forms being 40@45c. per lb., according to size and terms of order. Electrolytic, 3c. higher—**Quicksilver** is rather more active and inclined to be stronger. New York price is $52 per flask of 75 lb. San Francisco, $51 for domestic orders. London price is higher, at £11 12s. 6d. per flask.

Minor Metals—Current sales of **Bismuth** have been at $2.75 per lb., New York. **Selenium**—Quotations are $2@3 per lb. for larger quantities; $4.50@5 per lb. for smaller lots.

Gold, Silver and Platinum

Gold in the United States, Jan. 2, is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, $967,974,869; in Treasury current balances, $216,393,851; in banks and circulation, $631,607,599; total, $1,815,976,319, a decrease of $1,145,381 during December.

A small lot of gold, about $200,000, was taken in London, Jan. 14, for shipment to New York.

Platinum—The market continues dull and sales have been light. Prices range from $40@43 per oz. for refined platinum, and $44@49 for hard metal.

Our Russian correspondent writes that the platinum market improved essentially during the last half of December. The market for small lots at Ekaterinburg was more active and prices advanced 45 ropeks, to 7.75 rubles per zolotnik—equal to $29.14 per oz.—for crude metal, 83% platinum. No official quotations are given, either at Ekaterinburg or Petrograd.

Three new dredges are being installed at the placers of the Nikolo-Pavdinsky Co. in the North Ural district. One dredge was built at the Putilov works in Petrograd; the other two were built at the Marion works in the United States.

Silver market has ruled steady around 22⅛d. in London without special feature. Demand continues limited.

For the week ending Jan. 7, Messrs. Pixley & Abell report shipments of silver from London to India at £157,000, against £65,000 in the first week of 1914. No shipments to China.

Coined silver in the United States, Jan. 2, is estimated by the Treasury Department as follows: Standard dollars, $565,921,478, of which $480,259,000 are held in the Treasury against silver certificates outstanding; subsidiary coins, $184,533,627; total, $750,455,105, an increase of $449,952 during December.

Zinc and Lead Ore Markets

JOPLIN, MO.—Jan. 16

Blende, high price, $56; assay base 60% zinc, $48@53.50; metal base 60% zinc, $46.50@48.50; average, all grades of zinc, $47.70 per ton.

Lead, high price, $49.10; base, $47 per ton of 80% metal content; average, all grades of lead, $46.96 per ton.

Another week of fair weather increased the lead output from shallow workings, but the week closes tonight with a blizzard raging. Some reserve zinc ore came upon the market at the increase in price offerings.

SHIPMENTS, WEEK ENDED JAN. 16

	Blende	Calamine	Lead	Values
Total this week.....	11,600,420	478,700	1,770,280	$323,650
Total this year.....	31,633,220	2,362,530	4,299,040	894,410

Blende value, the week, $275,120; three weeks, $761,400.
Calamine value, the week, $6980; three weeks, $32,110.
Lead value, the week, $41,550; three weeks, $100,900.

PLATTEVILLE, WIS—Jan. 16

The base price paid this week for 60% zinc ore was $51.50 per ton. The base price paid for 80% lead ore was $44 per ton.

SHIPMENTS, WEEK ENDED JAN. 16

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Year.....	9,259,300	160,000	1,203,500
Week.....	2,867,290	80,000	444,100

Shipped during week to separating plants, 3,431,070 lb. zinc ore.

Iron Trade Review

NEW YORK—Jan. 20

The month of January so far has shown only a small increase in new business, but specifications are better, and the mills are running to a higher percentage of capacity. Rail orders come in slowly, but bars and sheets are more active, and there is quite a demand for plates and shapes for ship work. Structural material is still rather slow.

The pig iron market has rather quieted down, but there is still a fair demand for foundry and basic iron.

The mills at Sault Ste. Marie, Ont., have taken orders for 20,000 tons of rails for railroads in the United States. It is reported that these orders were taken at $26 and $26.50 per ton; some rumors give even lower prices. It is also reported that the Dominion Steel Co. has been bidding for some rail orders.

PITTSBURGH—Jan. 19

The steel market has shown a slight increase in the volume of commitments in the past week but the improvement thus far in January does not altogether come up to expectations. According to theories entertained in December there would be a lull in the first half of January, on account of inventory taking and other adjustments, but thereafter a return would occur to the December activity. Thus far the market is quieter than in December, with the exception of tubular goods, which are making a better showing.

Steel prices are steady. The price of 1.10c. on bars, plates and shapes, as definitely advanced at the end of December, is barely maintained, and it develops that whereas the 1.05c. price named in December was supposed to apply only to prompt deliveries, there were some contracts made at this price, permitting specifications to be furnished early in the present quarter.

Railroad buying is very moderate, and shows improvement only by comparison with the complete inactivity of the late months of last year.

The steel mills are operating at an average of 45 to 50% of capacity, or considerably better than in November and December. Tinplate production is between 80 and 90% of capacity, an usually good showing for January.

Pig Iron—Prices are quotable at the same level as formerly: Bessemer, $13.75; basic, $12.50; No. 2 foundry and malleable, $12.75@13; gray forge, $12.50@12.75, at Valley furnaces, 95c. higher delivered Pittsburgh.

Ferromanganese—The market continues quiet, consumers being well stocked for the present and being unwilling to pay the asked price of $68, which they regard as high when delivery is not assured. The Jones & Laughlin Steel Co. is now operating one of its Aliquippa furnaces on ferromanganese, making about 100 tons daily, on ore imported a few months ago. Manganese ore imports dropped from 39,000 tons in October to 2000 in November.

Steel—The mills continue to quote $20 for billets and $20.50 for sheet bars, delivered Pittsburgh, but there is hardly any buying, consumers being well covered at considerably lower prices. Rods are regarded as firm at $25, Pittsburgh.

COKE

Connellsville—Yesterday the First National Bank of Uniontown, Penn., was closed, and this morning reecivers were appointed for the properties of its president, Josiah V. Thompson, who for years has been a spectacular buyer of coking coal lands, particularly in Greene County, representing an extension of the Connellsville seam. Liabilities are given at $22,000,000, of which $15,000,000 was secured by mortgages and collateral and $7,000,000 was unsecured except by Mr. Thompson's notes. Assets are stated to amount to $70,000,000, comprising coal acreage, securities and several parcels of real estate taken in payment for coal acreage sold. Estimates are that Mr. Thompson was interested in approximately 200,000 acres of coal. The steel industry in recent years has turned so largely to byproduct coking that it has taken less interest in Greene County and similar coking coals than was anticipated when Mr. Thompson began his accumulations over 10 years ago. The coke market is not apparently affected by the developments mentioned and is not likely to be, as there was little to disturb. Prompt furnace coke is a shade easier. The market is quotable at $1.55 for prompt furnace, $1.75 for contract furnace, $2@2.20 for prompt foundry and $2.15@2.25 for contract foundry.

PETROLEUM

Estimating December, the total production of oil in California in 1914 was 102,904,426 bbl.; deliveries, 95,356,791 bbl. Stocks on Dec. 31 were 57,405,836 bbl. In addition to the production there is reported a total of 6,728,000 bbl. "oil shut in."

Assessments

Company	Delinq.	Sale	Amt.
Andes, Nev.	Jan. 5	Jan. 27	$0.03
Belcher Silver, Nev.	Feb. 8	Mar. 1	0.10
Blue Bull, Nev.	Jan. 4	Feb. 8	0.01
Booth, Nev.	Jan. 25	Mar. 1	0.02
Carbonate, Ida.	Jan. 28	Feb. 28	0.001
Cash Boy, Nev.	Jan. 15	Feb. 15	0.005
Cedar-Talisman, Utah.	Feb. 8	Mar. 1	0.005
Century, Utah.	Jan. 2	Feb. 2	0.01
Clear Grit, Ida. (post.)	Feb. 9	Mar. 3	0.0015
Clearwater Con., Ida.	.....	Feb. 15	0.001
Con. Imperial, Nev.	Dec. 23	Jan. 15	0.01
East Hercules, Ida. (post.)	Jan. 1	Feb. 1	0.001
Emerald, Utah (three instal.)	.....	June 9	0.01
Gethin Le Roy, Utah.	Feb. 2	Feb. 23	0.02
Grt. Copp. King, Utah.	Dec. 21	Jan. 21	0.001
Gypsy Qn., Nev.	Jan. 12	Feb. 16	0.01
Happy Day, Ida.	Dec. 24	Jan. 25	0.0025
Hypotheek, Ida.	Dec. 17	Jan. 29	0.006
Idaho-Nev., Ida.	Jan. 7	Feb. 1	0.001
Keystone, Utah.	Dec. 21	Jan. 21	0.02
King Pine Crk., Ida.	Feb. 12	Mar. 13	0.002
Laclede, Ida.	Jan. 12	Feb. 3	0.003
Lehi Tintic, Utah.	Dec. 17	Jan. 16	0.0025
Lucky Friday, Ida.	Dec. 14	Feb. 11	0.003
MacNamara, Nev.	Jan. 12	Feb 3	0.03
Majestic-Idol, Nev.	Dec. 15	Jul. 20	0.005
Manhattan Con., Nev.	Feb. 30	Mar. 1	0.01
Moonlight, Ida.	Dec. 30	Jan. 28	0.005
Nabob, Ida.	Dec. 31	Jan. 25	0.005
Natl. Copper, Ida. (post.)	.....	Jan. 29	0.002
Nor. Bnkr. Hill, Ida.	Jan. 30	Mar. 6	0.002
Oreano, Ida.	Dec. 26	Jan. 25	0.00075
Phoenix, Ida. (post.)	Dec. 26	Jan. 26	0.005
Potosi, Nev.	Jan. 12	Feb. 4	0.02
Raven, Ida.	Dec. 30	Jan. 30	0.0003
Rescue-Eula, Nev.	Feb. 11	Mar. 22	0.01
Riverside, Ida.	Dec. 20	Jan. 20	0.001
Scranton Ex., Utah.	Jan. 4	Feb. 5	0.00025
Sheba, Utah.	Jan. 12	Feb. 24	0.05
Sierra Nevada, Nev.	Feb. 8	Mar. 2	0.05
Silver Star, Ida.	Jan. 5	Feb. 5	0.002
Sonora, Ida. post.	Nov. 30	Jan. 15	0.002
Sunset Dev., Ida.	Jan. 18	Feb. 18	0.0025
Syndicate, Ida. (post.)	.....	Jan. 28	0.001
Tarbox, Ida.	Jan. 28	Feb. 28	0.0025
Ton. Gip. Qn., Nev.	Jan. 12	Feb. 16	0.01
Umatilla, Nev.	Jan. 4	Feb. 8	0.01
Union Con., Nev.	Jan. 14	Feb. 4	0.05
Utah-Yerington, Nev.	Jan. 2	Jan. 23	0.0006
Verde May, Ida.	Feb. 1	Mar. 1	0 001

Stock Quotations

COLO. SPRINGS Jan. 19		SALT LAKE Jan. 15	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.05⅜	Beck Tunnel	.05¾
Cripple Cr'k Con.	.01½	Black Jack	.04
C. K. & N.	.06¾	Colorado Mining	.07
Doctor Jack Pot.	.10	Crown Point	.01
Elkton Con.	.47½	Daly-Judge	4.87½
El Paso	1.50	Gold Chain	.10½
Findlay	.03⅜	Grand Central	.64
Gold Dollar	.04	Iron Blossom	1.02½
Gold Sovereign	.04⅜	Little Bell	.10
Isabella	.18½	Lower Mammoth	.04
Jack Pot	.08½	Mason Valley	.75
Jennie Sample	.03	May Day	.16½
Jerry Johnson	.03½	Opohongo	.01
Lexington	.009	Prince Con.	.20½
Old Gold	‡.01	Seven Troughs	.03
Mary McKinney	.34	Silver King Coal'n.	2.32½
Pharmacist	.02	Silver King Con.	1.90
Portland	1.11	Sioux Con.	.02½
Raven B. H.	.03¾	Uncle Sam	.06
Vindicator	1.27	Yankee	.07

TORONTO Jan. 19			
Bailey	.01½	Foley O'Brien	‡.15
City of Cobalt	‡.30	Hollinger	22.25
Coniagas	5.25	Imperial	.01½
Peterson Lake	.25½	Jupiter	.09⅝
Right of Way	.02	McIntyre	.22½
T. & Hudson Bay	35.00	Pearl Lake	.03
Timiskaming	.13¾	Porcu. Gold	.75
Wettlaufer-Lor.	.04	Preston E. D.	.01
Big Dome	6.00	Rea	.22
Dome Exten.	.06½	Seneca Superior	1.00

SAN FRANCISCO Jan. 19			
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.04	Belmont	4.25
Belcher	.29	Jim Butler	.73
Best & Belcher	.07	Lone Star	.09
Caledonia	.30	MacNamara	.03
Challenge Con.	.05	Midway	.07
Confidence	‡.10	Mont.-Tonopah	.33
Con. Virginia	.13	North Star	.14
Crown Point (Nev.)	.01	Rescue Eula	.06
Gould & Curry	.02	West End Con.	.55
Hale & Norcross	.06	Atlanta	.39
Julia	.01	Booth	.39
Mexican	.60	C.O.D. Con.	.07
Occidental	.85	Comb. Frac	.08
Ophir	.10	Jumbo Extension	1.17½
Overman	.16	Pitts.-Silver Peak	.15
Potosi	.02	Round Mountain	.32
Savage	.05	Sandstorm Kendall	.11
Sierra Nevada	.10	Silver Pick	.10
Union Con.	.22	Central Eureka	‡.24
Yellow Jacket	.30	So. Eureka	‡2.25

N. Y. EXCH. Jan. 19	
Name of Comp.	Clg.
Amalgamated	58
Am.Sm.&Ref.,com	61⅜
Am. Sm. & Ref., pf.	101½
Am. Sm. Sec., pf. B.	78
Anaconda	27½
Batopilas Min.	.75
Bethlehem Steel, pf.	100½
Chino	35⅞
Colo. Fuel & Iron.	25½
Federal M. & S., pf.	28
Great Nor., ore., ctf.	29⅞
Guggen. Exp.	50½
Homestake	118
Inspiration Con.	19½
Mex. Petroleum	60⅜
Miami Copper	18½
Nat'l Lead, com.	47
National Lead, pf.	109½
Nev. Consol.	13⅜
Ontario Min	2
Phelps Dodge	‡175
Quicksilver, pf.	1½
Ray Con.	17⅜
Republic I&S, com.	22
Republic I&S, pf.	78
SlossSheffi'd, com	27
Sloss Sheffield, pf.	‡82
Tennessee Copper	31⅛
Utah Copper	54
U. S. Steel, com.	52½
U. S. Steel, pf.	108½

N. Y. CURB Jan. 19	
Name of Comp.	Clg.
Beaver Con.	.23
Big Four	.08
Blue Bell	.04½
Braden Copper	7½
B. C. Copper	‡.50
Buffalo Mines	.75
Can. Cop. Corpn.	1½
Can. G. & S.	.05
Caribou	‡.58
Chambers Ferland	.14½
Con. Ariz. Sm.	7/16
Coppermines Cons.	1⅛
Davis-Daly	1⅛
Diam'field-Daisy	.09
Dia. Black B.	.05½
Ely Con.	‡.01
Florence	.54
Goldfield Con.	1⅛
Goldfield Merger	.33
Greene Cananea	25
Kerr Lake	4⅛
La Rose	.80
McKinley-Dar-Sa.	.53
Mines of Am	2⅜
Mutual Min., pf.	‡2½
Nevada Hills	.29
New Utah Bingham	‡7/16
Nipissing Mines	5.70
Ohio Copper	.10
Oro	.12
Pacific Smelt	‡1/16
Stand'd Oil of N.J.	401
Standard S. L.	1⅜
Stewart	1 1/16
Tonopah	7 1/16
Tonopah Ex.	2 9/16
Tonopah Merger	.30
Tularosa	5/16
West End Ex.	.03½
Yukon Gold	2⅜

LONDON Jan. 7			
Name of Comp.	Clg.		
Alaska Tre'dwell	£8	0s	0d
Camp Bird	0	6	6
El Oro	0	10	0
Esperanza	0	8	9
Mexico Mines	4	0	0
Oroville	0	10	3
Santa Gert'dis	0	8	9
Tomboy	1	2	6

BOSTON EXCH Jan. 19	
Name of Comp.	Clg.
Adventure	1½
Ahmeek	245
Alaska Gold M.	28½
Algomah	.50
Allouez	.37
Am. Zinc	18⅜
Ariz. Com., ctfs.	4 5/16
Bonanza	‡.41
Butte-Ballaklava	2
Butte & Superior	43⅛
Calumet & Ariz.	55
Calumet & Hecla	360
Centennial	15½
Cliff	‡1
Copper Range	32½
Daly West	1⅜
East Butte	8⅛
Franklin	4⅜
Granby	62½
Hancock	11½
Helvetia	.25
Indiana	3½
Island Cr'k, com.	45½
Island Cr'k, pfd.	87
Isle Royale	19½
Keweenaw	2⅜
Lake	6½
La Salle	3½
Mass	3½
Mayflower	5½
Michigan	.50
Mohawk	48½
New Arcadian	6½
New Idria Quick	‡3½
North Butte	23½
North Lake	1½
Ojibway	.75
Old Colony	4½
Old Dominion	43
Osceola	68½
Quincy	50½
Santa Fe	1⅜
Shannon	4⅜
Shattuck-Ariz.	24
Superior	25⅝
Superior & Bost.	1⅜
Tamarack	27½
Trinity	‡3
Tuolumne	.19
U. S. Smelting	20½
U. S. Smelt'g, pf.	39
Utah Apex	2½
Utah Con.	10½
Victoria	1⅜
Winona	1½
Wolverine	37
Wyandot	.50

BOSTON CURB Jan. 19	
Name of Comp.	Bid.
Alvarado	.60
Bingham Mines	‡3¾
Boston Ely	.15
Butte & Lon'n Dev.	.23
Calaveras	.95
Calumet-Corbin	.17
Chief Con.	.80
Corbin	‡1
Cortez	.15
Crown Reserve	.76
Eagle & Blue Bell	.95
First Nat. Cop.	1 3/16
Houghton Copper	1⅜
Iron Cap Cop., pf.	‡5
Majestic	.13
Mexican Metals	.14
Nevada-Douglas	.63
New Baltic	1½
Oneco	.75
Raven Copper	.05
Smokey Dev.	.10
So. Lake	.04⅞
Tonopah Victor	‡.17
Trethewey	.14
United Verde Ext.	2

‡Last Quotations.

Monthly Average Prices of Metals

SILVE

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61.642	57.506	27.190	28.357	26.573
March	58.375	57.870	58.067	26.875	26.669	26.788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	60.880	60.361	58.175	28.038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.199	25.948
July	60.654	58.721	54.678	27.919	27.074	25.219
August	61.606	59.293	54.344	28.375	27.335	25.979
September	63.078	60.640	53.290	29.088	27.986	24.260
October	63 471	60.793	50.654	29.299	28.083	23.199
November	62.792	58.995	49.082	29.012	27.263	22.703
December	63.365	57.760	49.375	29.320	26.720	22.900
Year	60.835	59.791	54.811	28.042	27.576	25.314

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic		London Standard		London Best Selected	
	1913	1914	1913	1914	1913	1914
January	16.488	14.223	71.741	64.304	77.750	69.488
February	14.971	14.491	65.519	65.259	71.575	70.188
March	14.713	14.131	65 329	64.276	70.658	69.170
April	15.291	14.211	68.111	64.747	74.273	69.313
May	15.436	13.996	68 807	63.182	74.774	67.786
June	14.672	13.603	67.140	61.336	70.821	66.274
July	14.190	13.223	64.166	60.540	69.446	64.955
August	15.400	*	69.200	‡	74.313	‡
September	16.328	*	73.125	‡	78.614	‡
October	16.337	*	73.383	‡	79.250	‡
November	15.182	11.739	68.275	53.227	73.825	*
December	14.224	12.801	65.223	56.841	69.583	*
Year	15.269	13.602	68.335	61.524	73.740	68.168

TIN

Month	New York		London	
	1913	1914	1913	1914
January	50.298	37.779	238.273	171.905
February	'8.766	39.830	220.140	181.556
March	46.832	38.038	213.615	173.619
April	49.115	36.154	224.159	163.963
May	49.038	33.360	224.143	150.702
June	44.820	30.577	207.208	138.321
July	40.260	31.707	183.511	142.517
August	41.582	*	188.731	‡
September	42.410	32.675	193.074	‡
October	40.462	30.284	184.837	‡
November	39.810	33.304	180.869	139.391
December	37.635	33.601	171.786	147.102
Av. year	44.252	34.301	206.279	156.564

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4.048	4.175	3.937	16.550	19.606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3.688	17.597	18.225
May	4.342	3.900	4.226	3.808	18.923	18.503
June	4.325	3.900	4.190	3.810	20.226	19.411
July	4.353	3.891	4.223	3.738	20.038	19.051
August	4.624	3.875	4.550	3.715	20.406	‡
September	4.698	3.828	4.579	3.658	20.648	‡
October	4.402	3.528	4.253	3.384	20.302	‡
November	4.293	3.683	4.146	3.585	19.334	18.500
December	4.047	3.800	3.929	3.662	17.798	19.097
Year	4.370	3.862	4.238	3.737	18.743	19.079

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5.228	25.338	21.413
March	6.078	5.250	5.926	5.100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5.074	5.256	4.924	24.583	21.393
June	5.124	5.000	4.974	4.850	22.143	21.345
July	5.278	4.920	5.128	4.770	20.592	21.568
August	5.658	5.568	5.508	5.418	20.706	‡
September	5.694	5.380	5.544	5.230	21.148	‡
October	5.340	4.909	5.188	4.750	20.614	‡
November	5.229	5.112	5.083	4.962	20.581	25.016
December	5.156	5.592	5.004	5.430	21.214	27.369
Year	5.648	5.213	5.504	5.061	22.746	22.544

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14.94	$17.35	$13.23	$18.59	$13.99
February	18.15	15.06	17.22	14.12	18.13	14.08
March	18.15	15.07	16.96	13.94	17.53	14.10
April	17.90	14.90	16.71	13.90	16.40	14.13
May	17.68	14.90	15.80	13.90	15.40	14.27
June	17.14	14.90	15.40	13.90	15.10	13.96
July	16.31	14.90	15.13	13.90	14.74	13.90
August	16.63	14.90	15.00	13.90	14.88	14.08
September	16.65	14.90	15.04	13.90	14.93	14.03
October	16.60	14.84	14.61	13.75	14.80	13.97
November	16.03	14.59	13.91	13.43	14.40	13.83
December	15.71	14.70	13.71	13.45	14.28	13.82
Year	$17.09	$14.88	$15.57	$13.78	$15.77	$14.01

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton. * Not reported. ‡ London Exchange closed.